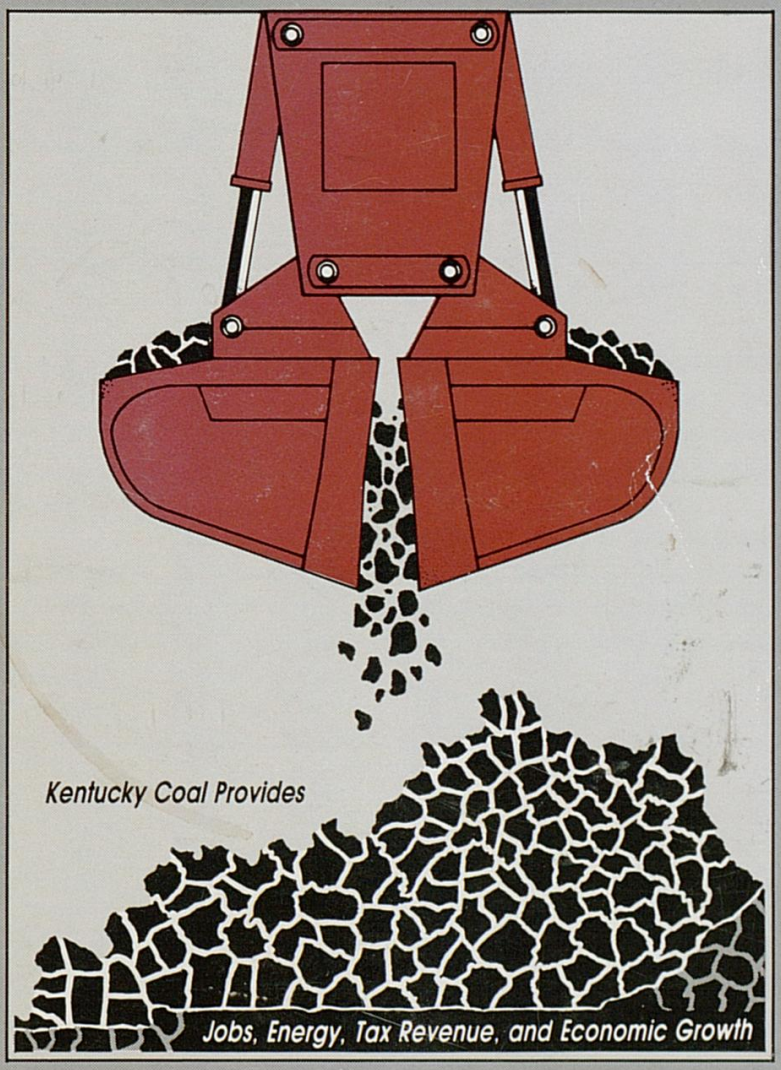
1989-90 POCKET GUIDE

KENTUCKY COAL FACTS



Prepared by the

Governor's Office For Coal and Energy Policy

and the

Kentucky Coal Association

Highlights

Kentucky Coal Facts

- The Kentucky coal industry employed 31,500 persons in 1988.
- The Kentucky coal industry paid over $1 billion in wages in 1988.
- Almost all of Kentucky's electricity is generated from coal.
- 72% of Kentucky's coal is shipped to electric utilities.
- Kentucky coal companies paid almost $180 million in coal severance taxes in Fiscal Year 1988–1989.
- Many Kentucky communities are dependent on the coal industry.
- Kentucky produced 161.2 million tons of coal in 1988, compared to a record 177.3 million tons in 1987.
- Kentucky, the number one coal producer from 1973 to 1987, became number two in 1988, behind Wyoming.
- Safety is steadily improving in the industry as a whole.
- All surface-mined land today must be reclaimed to be at least as productive as before mining.
- Coal can be and is being burned more cleanly today.

Released for printing November 15, 1989

Foreword

The Kentucky coal industry is vital to the economy of the Commonwealth. Kentucky coal means thousands of jobs and millions of dollars in tax revenues. It generates billions of dollars for Kentucky's economy.

In addition. Kentucky coal is an important energy source. It creates almost all of Kentucky's electricity and is shipped to electric utilities and industries in many other states.

Coal has played an important role in the history of Kentucky and the United States and will play an important role in our future. As a reasonably-priced. reliable source of electricity. coal should become a key player in a national energy policy that would reduce dependence on foreign energy.

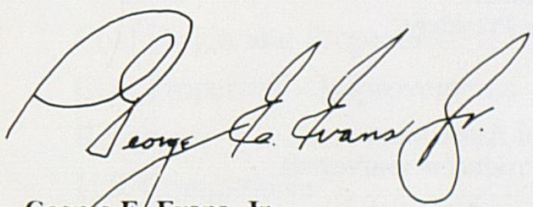
The coal industry has made great strides in solving its problems in the past. The industry has high standards for reclaiming mined land. has become a much safer industry. and has reduced its impact on the environment.

New challenges face the Kentucky coal industry today -- fewer mining jobs. high costs and low prices. increased competition from other states. acid rain legislation. environmental concerns. and the effects from foreign competition with U.S. coal.

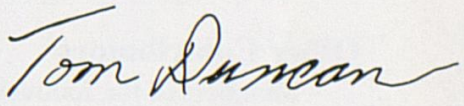
Kentucky Coal Facts was prepared to provide quick information about coal to government officials. legislators. regulatory personnel. media representatives. community leaders. educators. students. and other citizens. Each major section of information provides references for those requiring more detailed information.

This booklet was a joint project between the Governor's Office for Coal and Energy Policy and the Kentucky Coal Association. a non-profit organization of coal producers. Free copies are available from our offices or from members of the Kentucky Coal Association.

We welcome your feedback. comments. and suggestions on ***Kentucky Coal Facts.***



George E. Evans, Jr.
Special Assistant to the Governor
Governor's Office for Coal
and Energy Policy



Tom Duncan
President
Kentucky Coal
Association

Acknowledgements

Kentucky Government Agencies

Governor's Office
- Department of Local Government

Cabinet for Human Resources
- Department for Employment Services

Natural Resources and Environmental Protection Cabinet
- Department for Surface Mining Reclamation and Enforcement

Public Protection and Regulation Cabinet
- Department of Mines and Minerals

Revenue Cabinet

Transportation Cabinet
- Coal Haul Highway Section

U.S. Government Agencies

U.S. Department of Energy
- Energy Information Administration

U.S. Army Corps of Engineers

Railroad Companies

- CSX Transportation, Inc.
- Norfolk Southern Corporation
- Paducah and Louisville Railway
- TransKentucky Transportation Railroad, Inc.
- Tradewater Railway Company

Kentucky Coal Association Officers

- S.O. "Bud" Ogden	Chairman
- Donald P. Brown	Vice Chairman
- Raymond A. Bradbury	Secretary
- Tom Duncan	President
- Bill K. Caylor	Vice President

Other Contributors

- Members of the Kentucky Coal Association
- Kentucky Metallurgical Coal Producers (Surveyed)

Special Acknowledgements

Special thanks to those who daily did the typing, composition, artwork, typesetting, etc:

Krina Fry	Graphic Designer
Tears Molohon	Typing
Joan Richardson	Computer Compositions

Contents

5 Types of Mining

Kentucky has two distinct coal fields, each containing numerous deposits of bituminous coal of various characteristics and mines of every type and size. By the use of large draglines and shovels, the excavation of two or more coal seam deposits (multi-seam mining) is possible in the large "*area surface mines*" of the gently rolling ***Western Kentucky*** coal field and in the large "*mountain top removal mines*" in the steeper terrain of the ***Eastern Kentucky*** coal field. Both the Eastern and Western Kentucky coal fields have large, modern, and efficient underground mines (of various entry types) utilizing improved mining methods with increased mechanization – continuous miners, longwall mining panels, or both.

- Of Kentucky's 161.2 million tons of 1988 coal production, 99.1 million tons were produced by underground mining methods and 62.1 million tons were produced by surface mining methods.

- A breakdown of the different types of surface and underground mining methods used in Kentucky is as follows:

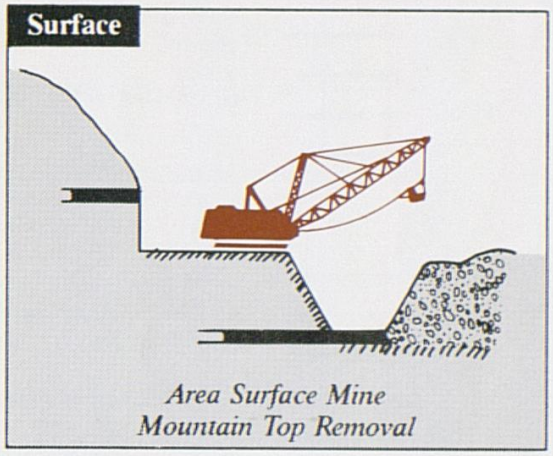
1988 Mining Types

Mine Type	No. of Mines	Prod. Million Tons	Employees
Surface			
Surface Mining	377	19.7	5,274
Surface & Auger	643	41.2	17,798
Auger Mining	96	1.15	398
Underground			
Room and Pillar *	970	99.1	20,852
Longwall ** Mining	(6)	(10.0)	(1,070)
State Totals *	**2,086**	**161.2**	**44,322**

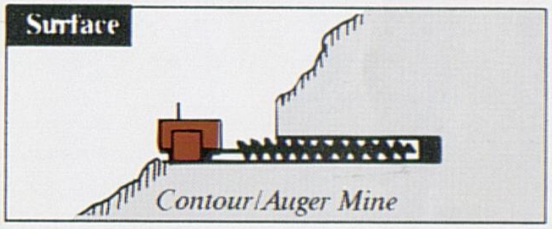
* Underground "Room and Pillar" values include the "Longwall mining" estimates.

** Longwall mining figures are not reported separately and values are estimates from phone surveys by the Governor's Office for Coal and Energy Policy. The longwall production and employee estimates usually include 2 conventional mining sections used to support the development of the longwall panels. Only 5 of the 6 longwall mines were active during 1988.

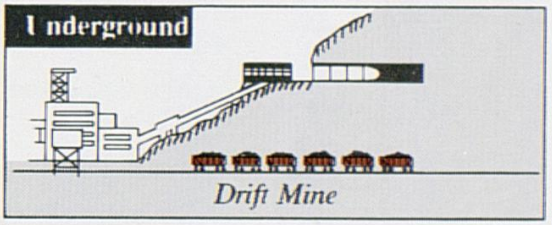
Sources:
- Ky. Dept. of Mines and Minerals, 1988 Annual Report.
- Governor's Office for Coal and Energy Policy.



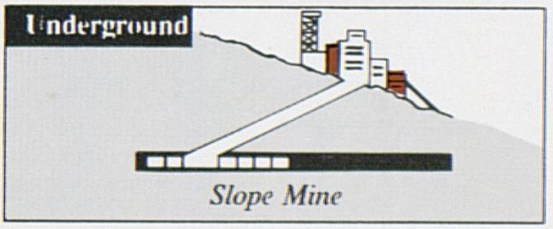
Area Surface Mine
Mountain Top Removal



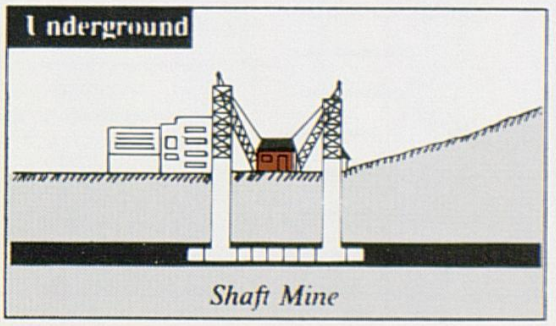
Contour/Auger Mine



Drift Mine



Slope Mine



Shaft Mine

Source: Energy Information Administration, Coal Data: A Reference, 1989.

History

1701 **Coal was discovered in Virginia.**

First recorded U.S. coal production (1748).

1750 April 13, 1750 Dr. Thomas Walker first recorded person to discover and use coal in Kentucky.

1755 Lewis Evan's map showing coal in what is now the Greenup County and Boyd County area of Kentucky.

1760 **First commercial U.S. coal shipment (1758).**

1820 First commercial mine opened in Ky.–near the Green River and known as the "McLean drift bank" near Paradise in Muhlenberg County.

328 short tons mined and sold in Kentucky.

1830 **2,000 tons of Kentucky production.**

10,000 tons of Kentucky production (1837).

1840

100,000 tons of Kentucky production.

1850 **150,000 tons of Kentucky production.**
Lexington and Big Sandy railroad proposed.
Kentucky Geological Survey established.

1860 **Pre-Civil War Kentucky production record of 285,760 tons.**

Surface mining begins near Danville, Ill. (1866).

1870 **Post-Civil War Kentucky production decline to 150,582 tons.**
1st train off the Big Sandy Railroad (1872).

Coal mined with steam-powered shovel (1877).

One million tons of Kentucky production (1879).

1880 Mechanical stokers introduced.
Mine Ventilation Law.
1st train from Williamson, W.Va. to Pike County, Ky.
Coal mining machines come into general use.

1890 Miner Pay Law.
United Mine Workers of America formed.

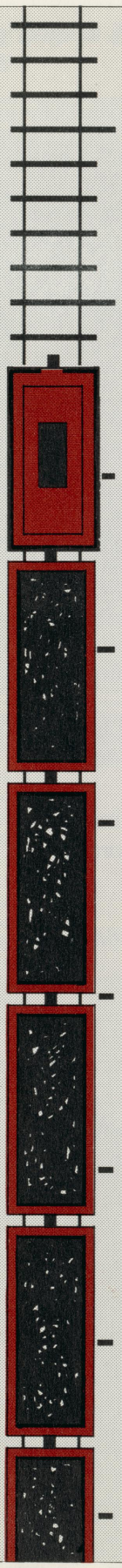
Machines developed to undercut coalbeds.

1900 5,000 kilowatt steam turbine generates electricity.
Child Labor Law.

1910 1st train off the Lexington and Eastern Railroad.
Independent Geological Survey established.
1st train from the Cumberland Valley Railroad.

Sources: – Energy Information Administration. Coal Data: A Reference. 1989.
– Ky. Dept. of Mines and Minerals. Annual Report.
– Willard Rouse Jillson. Coal Industry in Ky., 1922.

History



World War I increases demand for coal; Kentucky production 20.3 million tons (1914).
Short-flame or "permissible" explosives developed.
Mine Safety Law (1914).

1920

1st pulverized coal firing in electric power plants.
Federal Mineral Leasing Act (1920).
42.1 million tons of Kentucky production.
All-time high U.S. employment of 704,793 bituminous coal and lignite miners (1923).
1st dragline excavators built especially for surface mining.

1930

Stock market crash (1929).

Walking dragline excavators developed.

47.7 million tons of Kentucky production (1936).

1940

World War II—coal production in Kentucky rises to 72.4 million tons for the war effort.
Auger surface mining introduced.
Kentucky Coal Association founded 1942
Post-war Marshall Plan—production rises to 88.7 million tons in Kentucky.

1950

Continuous underground mining systems developed.
Kentucky Water Contamination Legislation.
82.2 million tons of Kentucky production (1950).

Fish and Wildlife Coordination Act (1956).
Railroads converting from coal to diesel fuel.
Roof bolting introduced in underground mines.

1960

Railroads began using unit coal trains.
1st longwall mining with powered roof supports.
Kentucky Surface Mining Legislation.

Kentucky coal production exceeded 100 million tons.
National Historic Preservation Act (1966).
Federal Coal Mine Health and Safety Act (1969).

1970

Federal Clean Air Act (1970).
Kentucky Coal Severance Tax established (1972).
Federal Water Pollution Control Act (1972).
Kentucky becomes the leading coal producing state.
Endangered Species Act (1973).
OPEC oil embargo; coal production and prices rise.
Federal Coal Leasing Amendments Act (1976).
Federal Surface Mine Control and Reclamation Act (1977).

1980

Current Events of the '80s

OPEC cuts oil prices for first time (1983).

1985

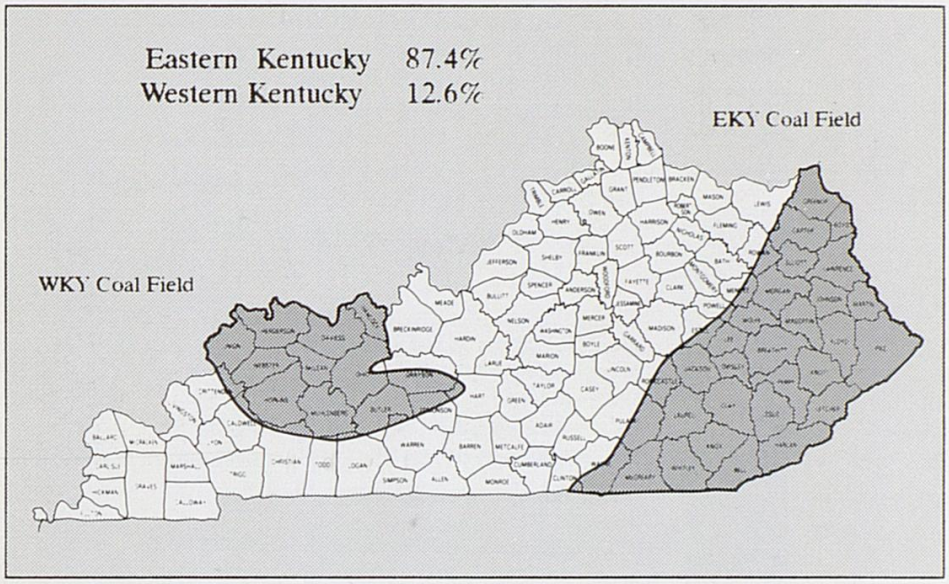
Coal Summit I (1985).

Coal Summit II (1987).
Kentucky's record production to date—177.3 million tons (1987).
TVA 160-MW Atmospheric Fluidized Bed Combustion Unit comes on line (1988).
Wyo. displaces Ky. as the leading coal producing state.
Kentucky Energy Cabinet becomes Governor's Office for Coal and Energy Policy (1989).

Employment

The Kentucky coal mining industry has a current work force of over 31,500 people directly employed in coal mining jobs.

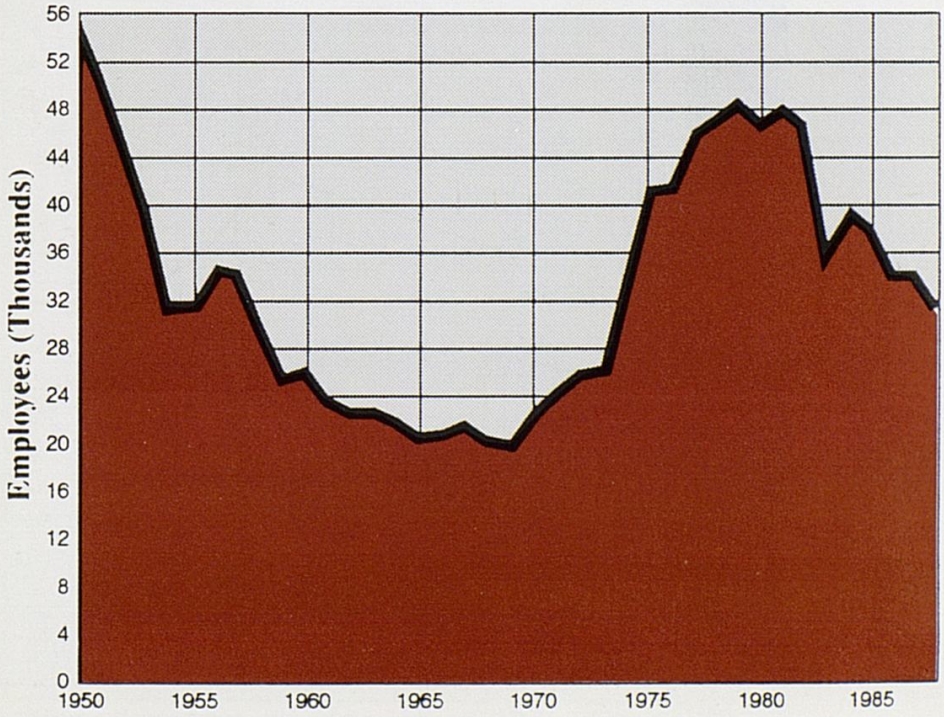
Percent of Kentucky's Coal Mining Work Force



Eastern Kentucky averages 87.4% of Kentucky's coal mining work force and accounts for almost 75% of Kentucky's total coal production.

West Kentucky averages 12.6% of Kentucky's coal mining work force, while accounting for over 25% of Kentucky's coal production.

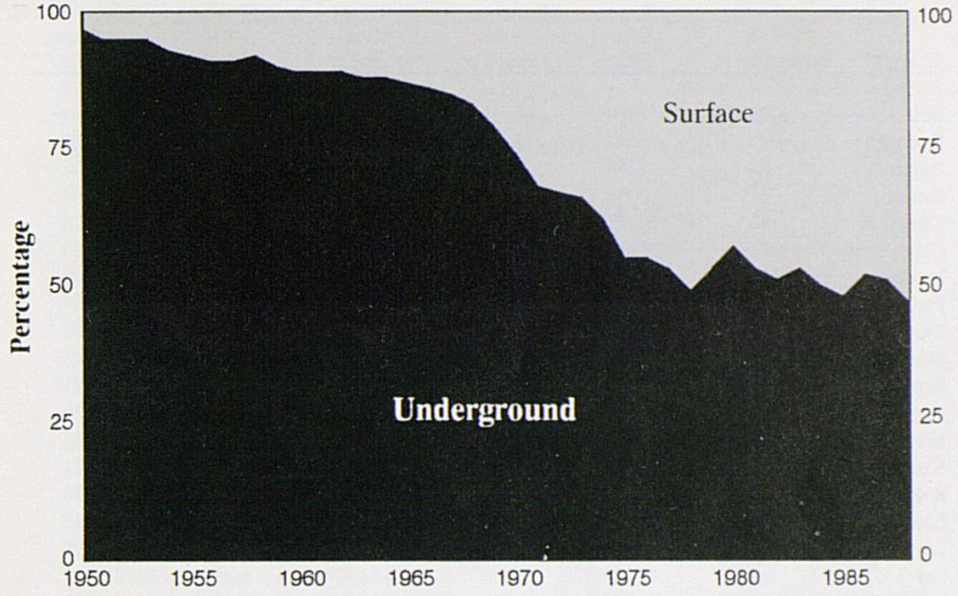
Coal Mining Employment in Kentucky, 1950 – 1988



Source: Kentucky Cabinet For Human Resources.

Employment

Coal Mining Shift in Employment from Underground to Surface, 1950 – 1988



Source: Ky. Dept. of Mines and Minerals.

Kentucky Coal Mining Employment

Year	Total * Employees	Percent Employees ** Underground	Surface
1950	55,295	97	3
1951	50,795	95	5
1952	45,336	95	5
1953	39,767	95	5
1954	31,681	93	7
1955	31,942	92	8
1956	34,971	91	9
1957	34,488	91	9
1958	30,025	92	8
1959	25,842	90	10
1960	26,420	89	11
1961	23,911	89	11
1962	22,691	89	11
1963	22,985	88	12
1964	22,171	88	12
1965	20,886	87	13
1966	21,159	86	14
1967	21,590	85	15
1968	20,639	83	17
1969	20,285	79	21
1970	22,784	74	26
1971	24,614	68	32
1972	26,118	67	33
1973	26,481	66	34
1974	34,029	62	38
1975	41,458	55	45
1976	41,740	55	45
1977	46,106	53	47
1978	47,441	49	51
1979	48,884	53	47
1980	47,175	57	43
1981	48,375	53	47
1982	46,861	51	49
1983	36,673	53	47
1984	39,726	50	50
1985	38,162	48	52
1986	34,455	52	48
1987	34,381	51	49
1988	31,503	47	53

*Source: Kentucky Cabinet For Human Resources.
**Source: Ky. Dept. of Mines and Minerals.

- In the '50s and '60s and prior years, most Kentucky miners worked in underground mines. However, the makeup of the work force has shifted in recent years.

- A steady increase in the number of surface mine employees results in almost equal numbers of employees involved in surface and underground mining today.

Employment/Wages by County

Coal County Wages and Employment – 1988*

County*	Monthly Mining Employment	% of Labor Force	Miners as % Total Employed	Mining Wages	% of Total Wages	Average Weekly Mining Earnings***
Bell	1459	13.4%	15.3%	$ 41.720.582	26.1%	$549.91
Breathitt	791	16.6%	19.2%	30.383.668	46.1%	738.69
Butler	64	1.0%	1.1%	1.678.195	4.4%	504.27
Carter	66	0.7%	0.9%	1.397.095	2.7%	407.08
Christian	108	0.5%	0.6%	2.910.416	1.1%	518.24
Clay	970	16.0%	18.7%	28.331.172	39.3%	561.68
Daviess	390	0.9%	1.0%	10.567.633	1.9%	521.09
Fayette	77	0.1%	0.1%	3.049.224	0.1%	761.54
Floyd	1638	10.0%	11.4%	40.627.698	22.0%	476.99
Harlan	3043	25.6%	29.3%	93.901.466	50.2%	593.43
Henderson	459	2.1%	2.3%	21.177.733	6.6%	887.29
Hopkins	1699	8.5%	9.2%	68.236.067	20.5%	772.36
Johnson	169	2.1%	2.4%	3.546.932	4.7%	403.61
Knott	1428	23.8%	27.8%	38.331.920	59.0%	516.21
Knox	446	4.6%	5.1%	7.521.252	9.2%	324.30
Laurel	304	1.8%	2.0%	7.892.663	3.3%	499.28
Lawrence	168	3.4%	3.9%	3.432.242	9.4%	392.88
Lee	68	2.3%	2.6%	1.153.496	6.3%	326.21
Letcher	1679	19.2%	21.8%	49.113.586	47.6%	562.53
McCreary	60	1.5%	1.9%	1.846.563	7.6%	591.85
Magoffin	183	4.7%	5.9%	4.973.235	18.4%	522.62
Martin	1808	52.9%	61.2%	77.693.406	78.1%	826.38
Morgan	24	0.7%	0.8%	391.723	1.5%	313.88
Muhlenberg	1262	11.6%	13.4%	54.963.557	37.7%	837.55
Ohio	338	4.9%	5.7%	12.565.676	17.4%	714.93
Owsley	40	2.3%	2.5%	599.123	9.3%	288.04
Perry	2119	19.2%	22.0%	69.131.288	37.2%	627.39
Pike	5623	21.8%	25.6%	173.027.884	44.5%	591.76
Union	1943	31.1%	33.5%	80.572.544	54.8%	797.46
Webster	987	17.5%	19.2%	43.471.931	49.5%	847.01
Whitley	650	5.5%	6.2%	15.609.855	11.4%	461.83
Wolfe	11	0.5%	0.6%	139.249	1.2%	243.44
State Totals**	**31,503**	-----	-----	**$1,031,499,722**	-----	**$629.67**

* Counties with less than three employers or one employer with 80% of the total county miner work force were withheld to avoid disclosure of individual company data. The counties are as follows; Boone, Boyd, Breckinridge, Bullitt, Caldwell, Clinton, Estill, Greenup, Jackson, Jefferson, Leslie, Livingston, McCracken, McLean, Powell, Pulaski, Wayne.

** Columns do not add to the state totals due to withheld data.

*** Variation in average weekly mining income affected greatly by hours worked per week as well as hourly wage rate.

Source: Kentucky Cabinet For Human Resources.

- The Kentucky Coal County Wages and Employment table shows the imptance of mining jobs to coal producing counties.

- The very high percentage of mining jobs in some counties reflects their high degree of dependence on coal.

- A comparison of the "Miners as % Total Employed" to the "% of Total Wages" shows the degree that the county coal mining jobs pay more on average than the average county wage.

County Production

1988 Tons Produced and Number of Mines

Coal Field	Production in Tons			Number of Licensed Mines		
	Surface	Underground	Total	Surface	Underground	Total
Eastern Ky.	47,120,830	71,558,875	118,679,705	1,027	944	1,971
Western Ky.	14,983,899	27,545,594	42,529,493	89	26	115
Ky. Total	**62,104,729**	**99,104,469**	**161,209,198**	**1,116**	**970**	**2,086**

1988 Production By County and Type of Mine

County	Underground		Surface		Total	
	Mines	Tonnage	Mines	Tonnage	Mines	Tonnage
Eastern Kentucky						
Bell	37	2,801,272	56	2,555,613	93	5,356,885
Boyd	—	—	2	199,462	2	199,462
Breathitt	4	38,504	71	6,330,589	75	6,369,093
Carter	—	—	7	169,727	7	169,727
Clay	3	519,034	20	551,824	23	1,070,858
Clinton	4	367,074	—	—	4	367,074
Elliott	1	4,491	3	218,613	4	223,104
Floyd	108	5,328,282	58	4,435,576	166	9,763,858
Greenup	—	—	5	841,577	5	841,577
Harlan	144	10,995,603	48	2,263,628	192	13,259,231
Jackson	—	—	7	91,691	7	91,691
Johnson	10	905,678	20	323,420	30	1,229,098
Knott	62	4,608,534	74	1,467,674	136	6,076,208
Knox	73	820,321	46	975,434	119	1,795,755
Laurel	—	—	11	96,803	11	96,803
Lawrence	—	—	14	432,972	14	432,972
Lee	—	—	11	224,138	11	224,138
Leslie	30	6,162,171	31	1,422,776	61	7,584,947
Letcher	62	5,795,449	79	2,911,016	141	8,706,465
McCreary	—	—	2	28,110	2	28,110
Magoffin	8	267,259	29	1,713,626	37	1,980,885
Martin	31	8,418,064	44	4,357,376	75	12,775,440
Morgan	4	5,101	5	55,924	9	61,025
Owsley	—	—	20	314,824	20	314,824
Perry	23	2,025,875	129	6,657,845	152	8,683,720
Pike	284	21,789,829	172	6,784,135	456	28,573,964
Pulaski	1	38,128	4	316,185	5	354,313
Rockcastle	—	—	1	0	1	0
Wayne	—	—	2	126,839	2	126,839
Whitley	55	668,206	55	1,203,433	110	1,871,639
Wolfe	—	—	1	50,000	1	50,000
Western Kentucky						
Butler	—	—	12	1,597,585	12	1,597,585
Caldwell	—	—	2	24,272	2	24,272
Christian	—	—	1	268,831	1	268,831
Daviess	—	—	15	1,198,467	15	1,198,467
Edmonson	—	—	1	16,889	1	16,889
Hancock	—	—	1	13,092	1	13,092
Henderson	1	1,019,245	2	181,101	3	1,200,346
Hopkins	8	4,971,375	24	5,243,142	32	10,214,517
McLean	—	—	4	231,459	4	231,459
Muhlenberg	5	4,937,502	11	2,148,016	16	7,085,518
Ohio	—	—	12	2,281,903	12	2,281,903
Union	7	10,416,307	1	74,842	8	10,491,149
Webster	5	6,201,165	3	1,704,300	8	7,905,465
Totals	**970**	**99,104,469**	**1,116**	**62,104,729**	**2,086**	**161,209,198**

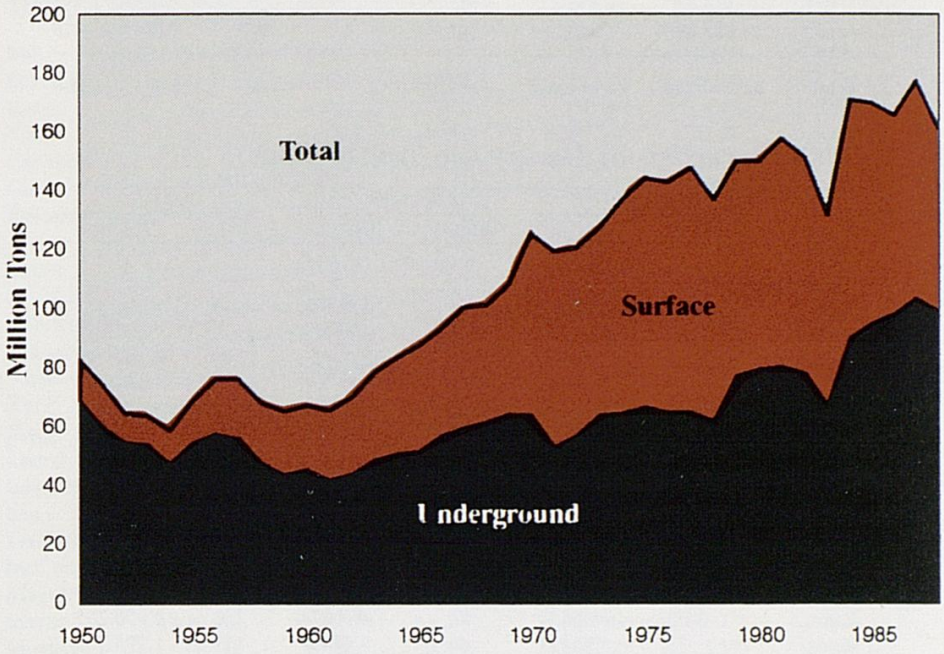
Source: Ky. Dept. of Mines and Minerals. Annual Report. 1988.

- ❑ Pike County was the leading coal producing county in Kentucky with over 28.57 million tons of production in 1988.
- ❑ Union County edged out Hopkins County to lead the production in Western Kentucky with 10.49 million tons.

Production

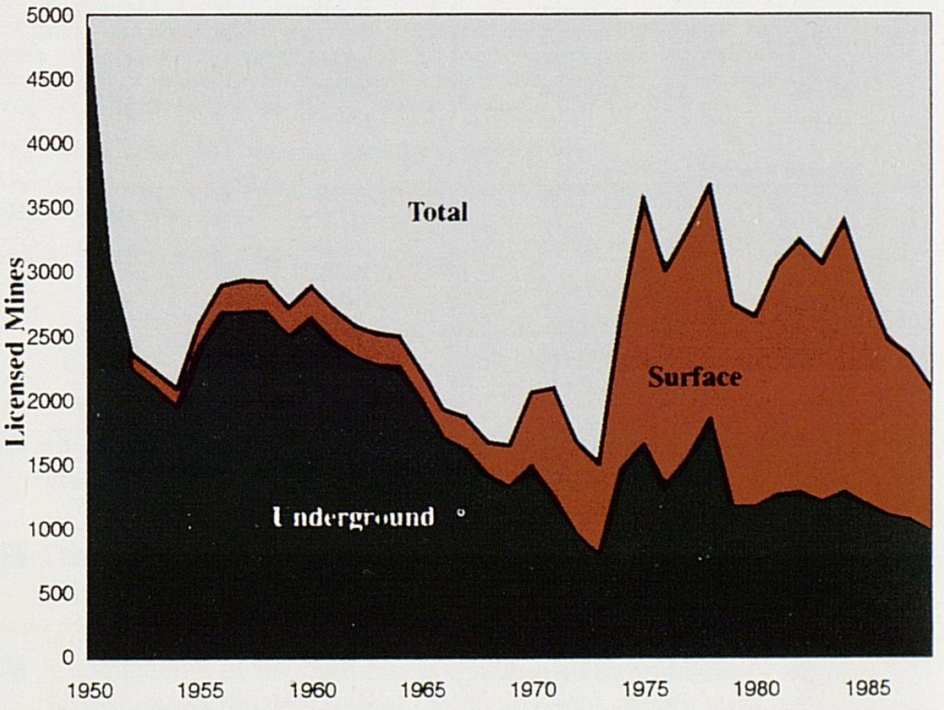
Kentucky produced 161.2 million tons of bituminous coal in 1988. down from the 1987 record production of 177.3 million tons.

Kentucky Production



Kentucky's most noticeable production trend is its increase in Eastern Kentucky underground production -- from a low of 28.1% of total Kentucky production in 1977 to the 1988 level of 44.4% of total Kentucky production. The Surface Mining Reclamation and Enforcement Act, enacted in 1977. was the major factor in this change.

Number of Licensed Mines in Kentucky



Source: Ky. Dept. of Mines and Minerals. Annual Report. 1950 - 1988.

Coal Mine Productivity (1977 – 1987) Tons/Miner/Hour

Year	Eastern Kentucky	Western Kentucky	Kentucky Average	Appalachian Coal Field	Interior Coal Field	Western U.S. Coal Field	U.S. Average
1977	1.71	2.22	1.86	1.36	2.42	5.85	1.82
1978	1.62	1.97	1.71	—	—	—	1.79
1979	1.54	1.94	1.64	1.33	2.21	5.47	1.81
1980	1.67	1.96	1.74	1.39	2.30	5.64	1.93
1981	1.76	2.12	1.84	1.51	2.35	6.15	2.10
1982	1.79	2.01	1.84	1.51	2.38	6.26	2.11
1983	1.98	2.43	2.08	1.75	2.69	7.60	2.50
1984	2.13	2.61	2.24	1.86	2.80	8.30	2.64
1985	2.13	2.57	2.23	1.90	2.81	8.55	2.74
1986	2.31	2.94	2.45	2.09	3.14	9.27	3.01
1987	2.59	2.98	2.69	2.30	3.33	10.42	3.30

Source: U.S. DOE – Energy Information Administration. Coal Production. 1977–1988.

Kentucky and U.S. Coal Production, 1950 – 1988 (Millions of Tons)

Year	Kentucky			United States	Kentucky as % of U.S.
	Eastern	Western	Total		
1950	57.5	24.7	82.2	516.3	15.9
1951	52.4	21.6	74.0	533.7	13.9
1952	44.5	20.0	64.5	466.8	13.8
1953	42.3	21.2	63.5	457.3	13.9
1954	36.1	22.5	58.6	391.7	15.0
1955	42.7	26.3	68.9	464.6	14.8
1956	46.1	29.8	75.9	500.9	15.2
1957	45.4	30.4	75.8	492.7	15.4
1958	39.5	28.3	67.8	410.5	16.5
1959	34.7	30.3	65.0	412.0	15.8
1960	36.7	30.4	67.1	415.5	16.1
1961	34.8	30.6	65.4	403.0	16.2
1962	38.4	31.7	70.1	422.1	16.6
1963	42.4	35.7	78.1	458.9	17.0
1964	45.3	38.0	83.3	487.0	17.1
1965	47.3	39.9	87.2	512.1	17.0
1966	51.3	42.0	93.2	533.9	17.5
1967	54.5	45.6	100.1	552.6	18.1
1968	54.8	46.1	101.0	545.2	18.5
1969	60.5	47.6	108.0	560.5	19.3
1970	75.6	52.7	125.3	602.9	20.8
1971	71.3	47.8	119.1	552.2	21.6
1972	68.0	52.3	120.3	595.4	20.2
1973	73.9	53.6	127.5	591.7	21.5
1974	85.0	51.8	136.8	603.4	22.7
1975	88.2	56.0	144.2	648.4	22.2
1976	89.0	53.6	142.6	678.7	21.0
1977	95.9	51.7	147.6	691.3	21.4
1978	97.0	39.8	136.8	665.1	20.6
1979	106.7	43.2	149.8	776.3	19.3
1980	109.2	41.0	150.1	823.6	18.2
1981	117.9	39.7	157.6	818.4	19.3
1982	112.1	39.3	151.3	833.5	18.2
1983	95.8	35.8	131.6	778.0	16.9
1984	124.6	46.1	170.7	891.8	19.1
1985	125.8	43.8	169.6	878.9	19.3
1986	119.9	45.7	165.6	885.9	18.7
1987	126.4	50.9	177.3	918.8	19.3
1988	118.7	42.5	161.2	949.8	17.0

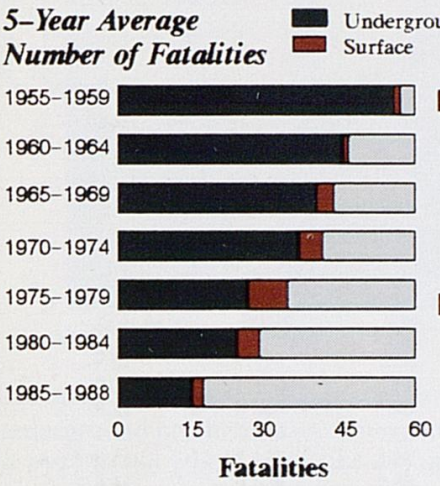
Sources: – Ky. Dept. of Mines and Minerals. Annual Reports. 1950–1988.

– U.S. DOE – Energy Information Administration. Coal Production. Coal Data: A Reference. 1989.

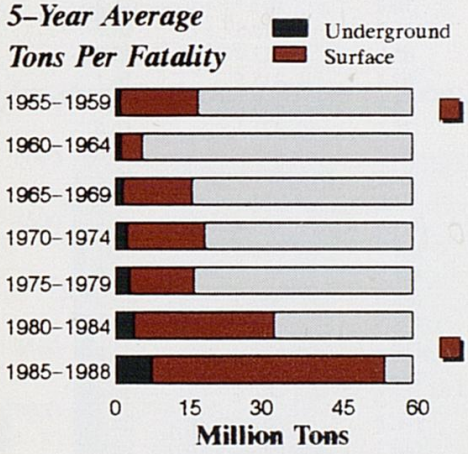
Safety/Training

- Safety and health conditions in U.S. coal mines have steadily improved: bituminous coal mining was thirteenth on a recent National Safety Council list of the most hazardous occupations.
- Safety and health standards are highly regulated by the national Mine Safety and Health Administration (MSHA) and the Kentucky Department of Mines and Minerals.
- All surface and underground mines are inspected regularly for violations: larger mines may have inspectors present daily.
- Miners are highly skilled technicians who receive extensive training, both general safety training and job–specific training.

Kentucky Gains in Productivity and Safety



- The bar chart shows the overall trend in mine safety improvements by averaging out somewhat erratic yearly data.
- 1988 ended with 11 mine fatalities, down 6 from the 4–year average of 17.25.



- The productivity bar chart indicates safety improvements both in underground and surface mines, with steady improvement in underground mines.
- 1988 underground production in tons per mine fatality reached an all–time high of over 11 million tons.

Source: Developed from Ky. Dept. of Mines and Minerals data.

Training for Surface Miners

- New miner training requires 24 hours of training before employment at a surface mine. This includes workers at prep plants, rail sidings, and river terminals, and all contract workers on a mine site must take the training.
- Each surface mine employee must receive 8 hours of annual retraining.
- To obtain a surface foreman certification, a miner must have 2 years of surface mining experience, plus pass a written examination.
- To obtain a surface blaster's license, a miner must have 2 years of work experience under an experienced blaster, plus pass a written examination.

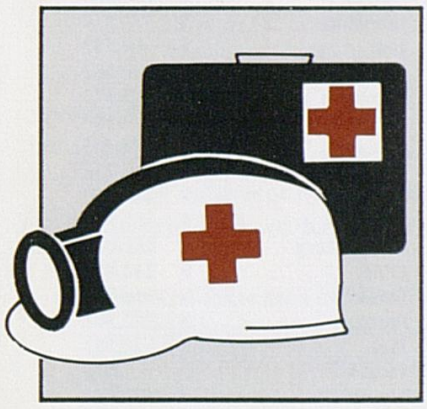
Underground Miner Classifications

Experience Required Years *	Underground Mining Position	Current No. of Miners Certified
10 Yrs.	Electrical Inspector	11
	Mine Inspector	457
	Mine Safety Analyst	37
5 Yrs.	Mine Foreman **	8,424
	Electrical Instructor	55
3 Yrs.	Asst. Mine Foreman **	2,917
	Fire Boss	19
	Instructor	293
	Belt Examiner	2,108
1 Yr.	Electrical Worker*	6,488
	Shot Firer/Solid Blasting*	3,795
	Drill Oper./Solid Blasting*	3,415
	Hoisting Engr.*	933
90 days	Mine Rescue	129
	Conventional Shot Firer *	11,972
	Gas Detection	12,258
	Certified Miners	23,192
Special Training		
	EMT– Emergency Medical Technician	915
	First Aid	826

* Test are required in addition to years of experience.
** Includes fire boss and first aid .

Source: Ky. Dept. of Mines and Minerals.

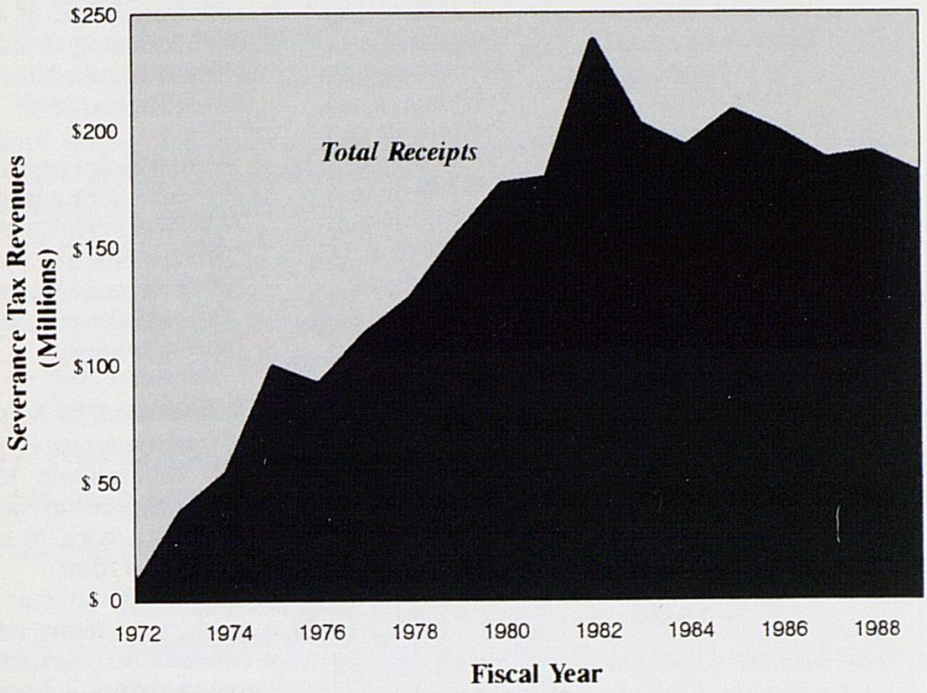
- New miner training requires a minimum of 48 hours of training to start work as a certified inexperienced miner.
- A certified inexperienced miner must work a minimum of 90 days in an underground mine and pass a written examination before becoming a certified experienced miner.
- A minimum of 16 hours of annual retraining is required to maintain the miner certification and continue to work at an underground mine.
- A newly hired miner (experienced or inexperienced) receives 8 hours of minesite–specific new miners training.
- Each miner receives new work assignment training of 20 hours minimum to become certified for each new job classification.
- An electrical retraining class is required annually to maintain certification.



- EMT – An emergency medical technician is required at underground coal mines employing 25 or more employees, with an additional EMT per each additional 100 miners or majority fraction thereof.
- EMT certification requires 110 hours of instruction and 10 hours of emergency room intern observations and training (4 written tests) plus 16 hours of retraining every 2 years, in addition to maintaining a cardiopulmonary resuscitation (CPR) certification.
- A minimum of 10 hours of First Aid training is required as part of the new miner training.

Tax Revenue

The Kentucky coal industry paid approximately $180 million in coal severance taxes in Fiscal Year 1988 – 1989.



Source: Kentucky Revenue Cabinet, Annual Report, 1972–88.

- While the gross value of coal per ton has declined, production has helped curb the decline in coal severance tax receipts.
- Part of the severance tax is returned directly to the counties (see chart below); part goes to Kentucky's General Fund.

Coal Severance Tax — Local Government Economic Assistance Fund Returned Directly to Coal Producing Counties.

Fiscal Year 1988–1989

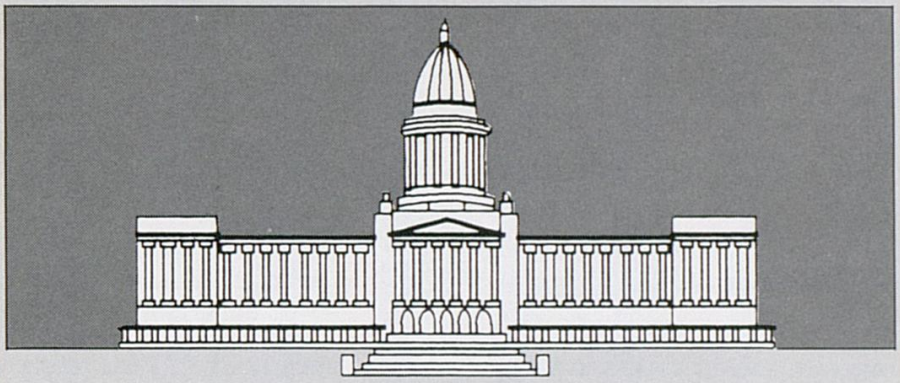
County &	Municipal Totals	County &	Municipal Totals
Bell	$ 605.869	Laurel	$ 160.523
Boyd	$ 293.979	Lawrence	$ 380.434
Breathitt	$ 682.111	Lee	$ 84.555
Butler	$ 185.445	Leslie	$ 802.382
Caldwell	$ 84.179	Letcher	$ 787.872
Carter	$ 122.464	McCreary	$ 109.167
Christian	$ 191.431	McLean	$ 78.441
Clay	$ 291.420	Magoffin	$ 266.473
Clinton	$ 114.330	Martin	$ 1.248.188
Daviess	$ 320.583	Morgan	$ 167.774
Elliot	$ 95.775	Muhlenberg	$ 681.027
Floyd	$ 975.795	Ohio	$ 244.837
Greenup	$ 202.020	Owsley	$ 106.276
Hancock	$ 55.067	Perry	$ 1.187.302
Harlan	$ 1.472.649	Pike	$ 2.574.507
Henderson	$ 215.929	Pulaski	$ 193.518
Hopkins	$ 973.944	Union	$ 881.821
Jackson	$ 95.302	Wayne	$ 111.639
Johnson	$ 346.615	Webster	$ 705.802
Knott	$ 575.205	Whitley	$ 356.075
Knox	$ 291.437	Wolf	$ 101.119
Coal producing counties			*$19.421.281*
Other counties impacted by coal			*$ 2.157.918*
State Total			**$21,579,199**

Source: Ky. Dept. of Local Goverment.

Tax Revenue

The gross value of Kentucky severed coal (mined coal) plus the value of processing during Fiscal Year 1988 – 1989 was $4.03 billion.

$4.03 Billion



To visualize $4.03 billion consider a wall of $10 bills 575 feet long and stacked 216 feet high.

The Kentucky coal industry paid over 1 billion dollars in total covered wages in 1988.

- Kentucky coal operators pay the same taxes other industries pay, plus several taxes specific to the industry:

Industry–specific taxes:	**Other taxes:**
Kentucky severance tax	Tangible property tax
Kentucky unmined coal tax	Intangible property tax
Federal black lung tax	Sales and use tax
Federal abandoned mine lands tax	Real estate tax
	Kentucky corporate income tax
	Federal income tax

19% of Kentucky's General Fund Revenues from Coal

- For Fiscal Year 1983–1984, the coal industry was responsible for about $570 million of the Commonwealth's General Fund revenue of $2.4 billion, nearly 24% of Kentucky's General Fund revenue.

- Recent increases in General Fund revenues and decreasing production and coal prices have reduced the percentage contribution of coal mining to state General Fund revenues to approximately 19%.

- Accepted studies indicate that the total tax revenue in a given year from coal mining can be estimated by multiplying the severance tax for that year by multipliers of either 2.55 or 2.97 or a figure between the two.

Sources – Governor's Office for Coal and Energy Policy.
– Seth Schwartz, Coal and the Kentucky Economy, 1985.
– John Abell, The Impact of the Coal Industry on the Kentucky Economy, 1983.
– Dr. Charles F. Haywood, Legislative Testimony, 1984.

Severance Tax by County

Coal Severance Tax Revenue by County, Fiscal Year 1988 – 1989

County	Gross Value of Severed Coal	Tax on Severed Coal	Gross Value of Processing	Total Tax Receipts
Bell	$ 122.560.765	$ 5.500.693	$ 10.939.024	$ 5.991.918
Boyd	11.476.129	517.826	27.225.382	1.674.700
Breathitt	133.079.077	5.994.777	9.257.312	6.401.570
Breckinridge	W	W	—	W
Butler	22.640.149	1.018.473	1.539.701	1.086.069
Caldwell	W	W	W	W
Carter	2.984.337	137.317	W	137.411
Christian	W	W	W	W
Clay	32.562.052	1.464.217	3.689.948	1.613.986
Clinton	W	W	W	W
Daviess	22.479.356	1.010.441	1.760.643	1.088.226
Edmonson	W	W	W	W
Elliott	2.757.307	120.883	—	120.883
Estill	W	W	W	W
Floyd	179.177.427	7.967.154	24.864.041	9.078.181
Greenup	15.073.680	684.141	228.313	693.950
Hancock	W	W	W	W
Harlan	329.964.097	14.746.267	39.628.582	16.525.771
Henderson	34.954.239	1.586.583	3.306.377	1.717.003
Hopkins	200.776.080	9.036.072	15.421.305	9.727.260
Jackson	1.655.849	74.673	—	74.673
Johnson	34.880.388	1.535.500	2.143.536	1.632.077
Knott	116.355.272	4.979.165	15.823.838	5.679.647
Knox	40.266.727	1.767.249	5.298.578	2.004.492
Laurel	3.337.277	127.708	545.889	152.274
Lawrence	5.386.648	226.224	533.092	249.844
Lee	3.657.344	164.588	294.297	175.579
Leslie	187.275.253	8.386.154	22.426.365	9.395.391
Letcher	189.197.154	8.108.140	27.396.275	9.339.218
McCreary	656.671	29.561	669.402	59.684
McLean	W	W	W	W
Magoffin	40.861.159	1.834.036	3.368.691	1.976.311
Martin	332.852.132	14.905.819	39.171.975	16.668.560
Morgan	13.566.437	602.220	2.405.856	710.483
Muhlenberg	136.520.161	6.143.408	11.876.482	6.677.848
Ohio	30.529.075	1.386.081	2.406.805	1.490.059
Owsley	5.175.596	225.948	239.220	236.713
Perry	252.769.949	11.288.372	23.499.980	12.344.893
Pike	609.841.448	27.299.304	92.095.142	31.441.558
Pulaski	7.813.673	352.716	290.466	365.780
Rockcastle	1.499	66	103.280	4.714
Union	215.159.381	9.682.174	22.671.454	10.702.391
Wayne	W	W	W	W
Webster	165.390.573	7.443.833	17.510.139	8.231.259
Whitley	54.165.671	2.413.731	14.664.367	3.070.226
Wolfe	238.372	11.247	308.452	25.127
State Totals*	**$3,574,109,626**	**$159,494,730**	**$457,746,078**	**$179,794,517**

W Withheld to avoid disclosure of individual company data.

* Columns do not add to State Totals because of counties in which information was withheld to avoid disclosure of individual company data.

Source: Kentucky Revenue Cabinet.

Eastern and Western Kentucky Severance Tax Contribution

Eastern Kentucky	$138.523.866
Western Kentucky	$ 41.270.651

- Pike County was the leading Eastern Kentucky county. paying in over $31 million in coal severance taxes during Fiscal Year 1988–1989.

- Union County was the leading Western Kentucky county. paying in over $10 million in coal severance taxes during Fiscal Year 1988–1989.

Coal Prices

There is no such thing as an average coal price as "*average*" coal price is an ambiguous term. There are as many coal price averages as there are coal qualities (i.e., sulfur, Btu), market types (i.e., steam coal, metallurgical or coking, industrial, export), sales conditions (i.e., spot market, extended spot market; short-term contract, long-term contract), sales location and included costs (i.e., FOB* mine, FAS**, CIF***, total delivered). Within each of these ways to sell coal, there are wide ranges of price. A further review of the major points at which coal is sold and the different cost included during the mine-to-market process of coal in Kentucky are as follows:

- Coal sold in place (reserves)
- Coal sold in the pit
- Gross value severed coal
- FOB*(Free on Board) The mine, railcar, river terminal, export terminal
- Gross value of the severed coal plus transportation
- Gross value of the severed coal plus transportation and processing
- FAS**(Free Along Side)
- CIF***(Cargo Cost, Insurance and Freight)
- Total delivered price

However, the U.S. Department of Energy does provide an average annual coal cost price which is useful for identifying trends only! For individuals not pricing, selling, buying or involved in the day-to-day marketing of Kentucky coal but just needing to follow the market price and trends, these values are helpful.

Average Value of Kentucky Coal FOB Mine (Dollars per Ton)

	Eastern Kentucky			Western Kentucky			Ky.
Year	Underground	Surface	Average	Underground	Surface	Average	Average
1976	$26.37	$20.36	$23.03	$15.12	$13.41	$14.18	$19.79
1977	$25.98	$18.71	$21.67	$19.88	$14.80	$17.07	$20.02
1978	$28.86	$22.58	$25.30	$22.78	$18.35	$20.36	$23.86
1979	$30.18	$24.85	$27.62	$26.26	$18.79	$22.17	$26.04
1980	$30.98	$26.23	$28.73	$27.40	$22.28	$24.72	$27.62
1981	$32.47	$28.86	$30.72	$30.92	$25.03	$27.66	$29.95
1982	$32.71	$28.85	$30.87	$32.50	$26.53	$29.25	$30.44
1983	$30.71	$28.43	$29.63	$30.72	$25.97	$28.09	$29.20
1984	$29.29	$27.84	$28.61	$28.68	$25.50	$26.81	$28.13
1985	$29.83	$27.41	$28.77	$26.79	$26.68	$26.73	$28.24
1986	$26.89	$25.67	$26.38	$24.25	$26.56	$25.31	$26.09
1987	$27.48	$25.74	$26.71	$25.06	$24.16	$24.68	$26.15
1988	$27.72	$25.92	$26.97	$24.89	$22.32	$23.96	$26.20

Source: U.S. Bureau of Mines, Minerals Yearbook, 1976; U.S. DOE, Bituminous Coal and Lignite Production and Mine Operations, 1977-1978, and Coal Production, 1979-1986; DOE - EIA, Coal Data : A Reference, May, 1989.

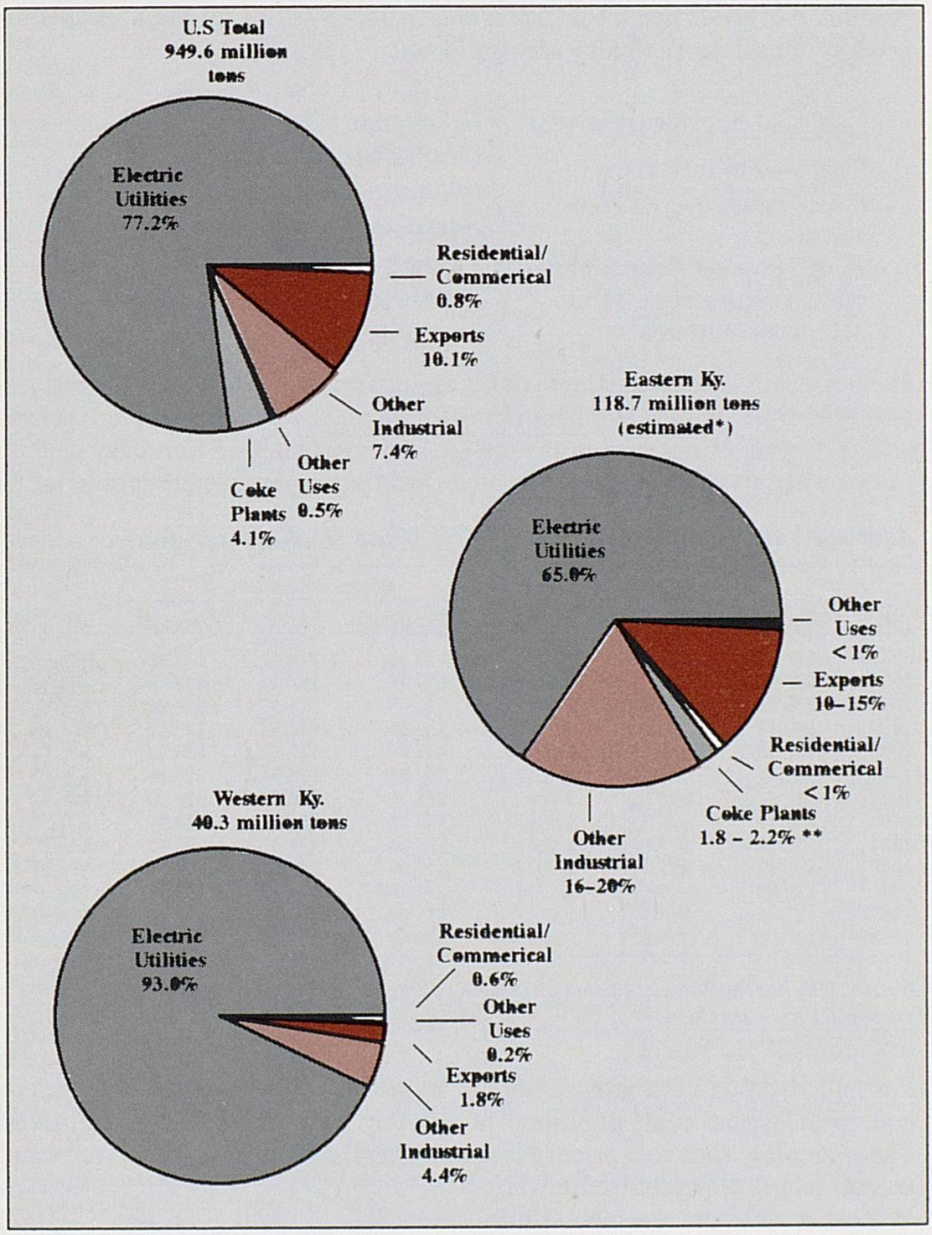
For an indication of month-to-month trends, the spot sales data (steam coal and metallurgical coal) published in monthly trade publications are useful. These monthly spot coal prices are usually presented in 3 or 4 different incremental ranges of percent sulfur (i.e., 0-0.75, 0.76-1.5, 1.6-3.0, 3.1-4.0) for at least 4 different average Btu/lb values (i.e., 11,000, 11,500, 12,000, 12,500). The monthly trade publications sometime list 9 to 12 average prices for each mine region such as the Appalachian and the Interior Basin. It must be kept in mind though that spot sales are only *one part* of total coal sales transactions.

A good source of average "*total delivered price*" of electric utility coal is the values reported by the utilities -- called U.S. DOE Energy Information Administration -- Form 423 data. This is a good source for market prices, since the electric utility industry is a major market source for Kentucky coal. However, when using these "*total delivered prices*" for trend comparisons, it should be remembered that "*total delivered price*" is affected greatly by *transportation costs* and only consistent origins and destinations must be utilized in yearly trend comparisons.

Uses of Coal

- Electric utilities represent the largest market for U.S. and Kentucky coal.
- The three major markets for coal are electric utilities. industry. and the export market.

Distribution of Coal by Consuming Sector, 1988



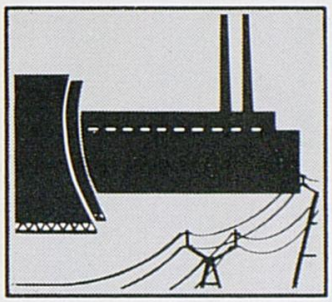
*Note: Eastern Kentucky coal field distribution data have been reported as part of the four–state U.S. Coal–Producing District 8 in the past and must be estimated. A breakdown of the data will be reported by U.S. Department of Energy starting in 1989.

** Based on a telephone survey by the Governor's Office for Coal and Energy Policy of 9 producers of Eastern Kentucky metallurgical coal.

Source: Governor's Office for Coal and Energy Policy based on data from U.S. DOE – Energy Information Administration.

Coal – Low Cost Energy

- U.S. electric utilities comprise 72% of Kentucky's coal market – 65% of Eastern Kentucky's market. 93% of Western Kentucky's market.

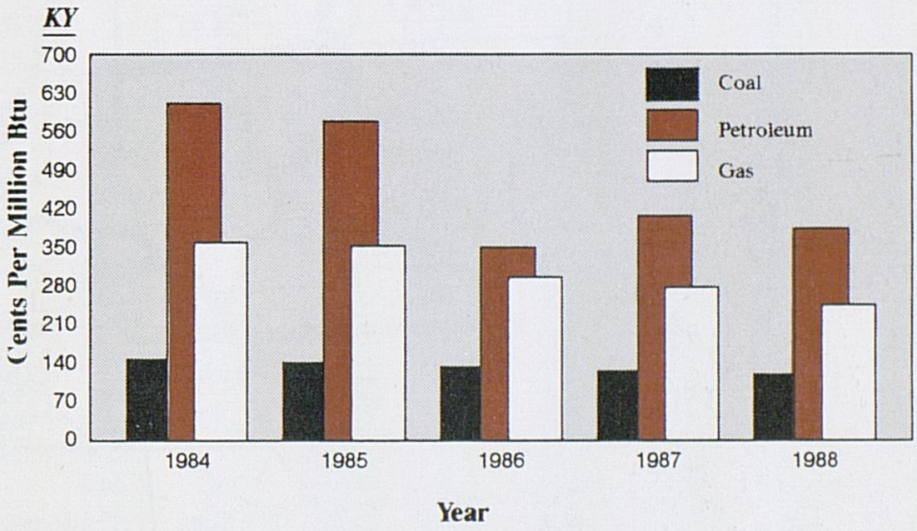


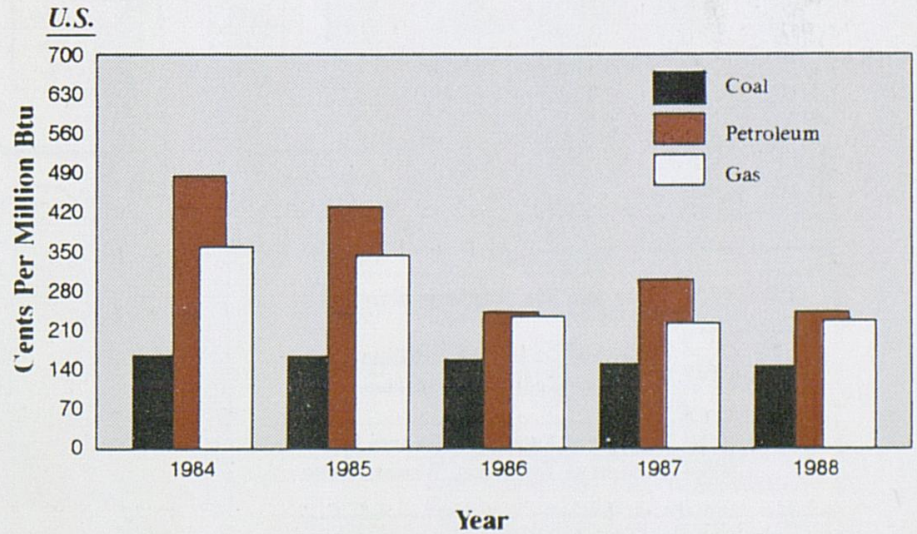
- Over 95% of Kentucky's electricity is generated from coal. (Hydro provides 4.37%. petroleum 0.18%. and gas 0.05%.)

- Kentucky exports around 20% to 40% of the 60 billion kilowatt–hours of electricity produced each year in the state.

- A review of fuel source comparisons shows not only the fuel cost saving of coal but the more stable price dependability of coal. ***Note that coal is the cheapest energy source on the chart below.***

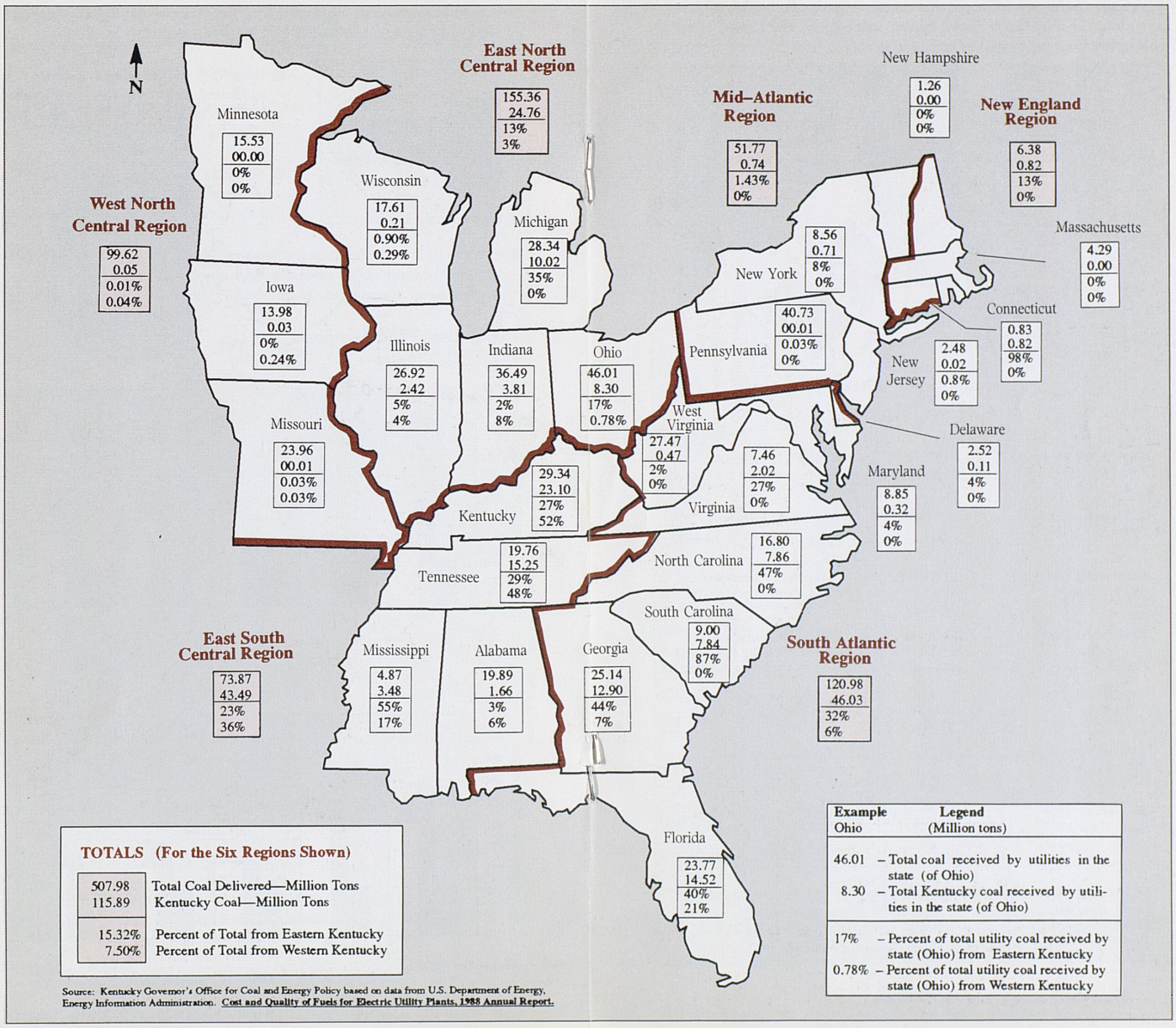
Average Cost of Coal, Petroleum, and Gas





Source: Energy Information Administration. Cost and Quality of Fuels for Electric Utility Plants. 1988.

Kentucky Coal Shipments to Electric Utility Plants by State in 1988



TOTALS (For the Six Regions Shown)

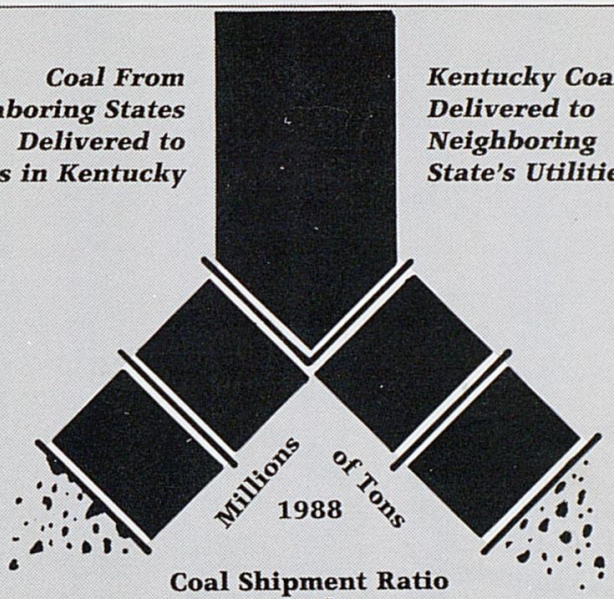
507.98	Total Coal Delivered—Million Tons
115.89	Kentucky Coal—Million Tons
15.32%	Percent of Total from Eastern Kentucky
7.50%	Percent of Total from Western Kentucky

Example Ohio	Legend (Million tons)
46.01	– Total coal received by utilities in the state (of Ohio)
8.30	– Total Kentucky coal received by utilities in the state (of Ohio)
17%	– Percent of total utility coal received by state (Ohio) from Eastern Kentucky
0.78%	– Percent of total utility coal received by state (Ohio) from Western Kentucky

Source: Kentucky Governor's Office for Coal and Energy Policy based on data from U.S. Department of Energy, Energy Information Administration. Cost and Quality of Fuels for Electric Utility Plants, 1988 Annual Report.

Distribution – Utility Coal

Kentucky exports over 5 tons of utility coal to neighboring states for every ton imported. The chart below shows the ***Interstate Imports and Exports*** of utility coal between Kentucky and its neighboring states. *



Coal Shipment Ratio and Net Flow

Kentucky *receives from Illinois* .02	KY:IL 125:1 →	**Illinois** *receives from Kentucky* 2.4
Kentucky *receives from Indiana* 3.0	KY:IN 1.26:1 →	**Indiana** *receives from Kentucky* 3.8
Kentucky *receives from Missouri* 0	KY:MO NA →	**Missouri** *receives from Kentucky* 0.01
Kentucky *receives from Ohio* 0.3	KY:OH 30:1 →	**Ohio** *receives from Kentucky* 8.3
Kentucky *receives from Tennessee* 0.2	KY:TN 63:1 →	**Tennessee** *receives from Kentucky* 15.3
Kentucky *receives from Virginia* 0	KY:VA NA →	**Virginia** *receives from Kentucky* 2.0
Kentucky *receives from West Virginia* 2.6	KY:WV 1:5.6 ←	**West Virginia** *receives from Kentucky* 0.5
Kentucky receives from Neighboring States 6.2 Million Tons*	**KY:NEIGHBORS 5.2:1 →**	**Neighboring States receive from Kentucky 32.3 Million Tons***

*Does not include metallurgical or industrial coal shipments.

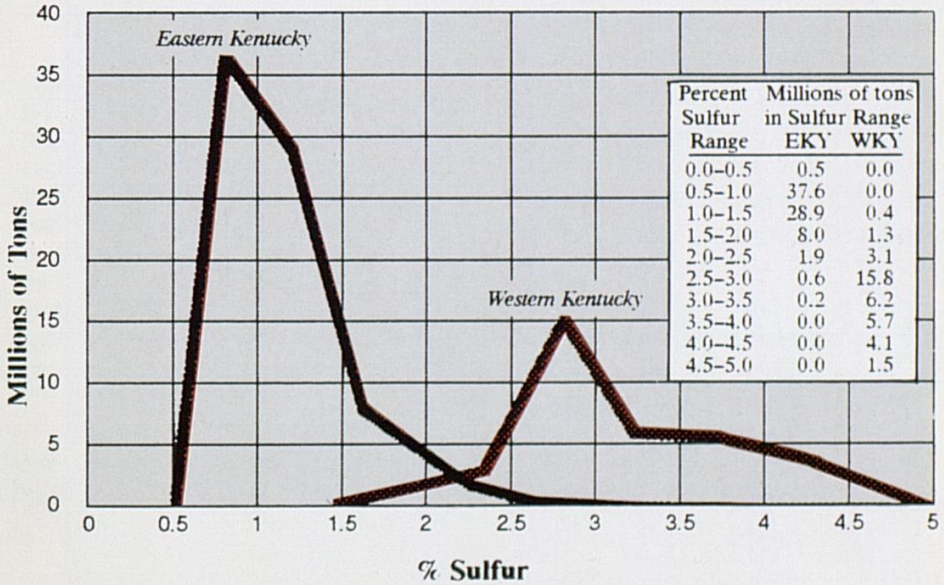
Source: U.S. DOE – Energy Information Administration. Cost and Quality of Fuels.

Distribution – Utility Coal

Kentucky Coal was Received by Electric Utility Plants in 23 States in 1988

Coal Field Destination State	Receipts Thousand Tons	% Receipts Surface	% Receipts Spot	Avg. Btu/lb	Ave. Percentage Sulfur	Ave. Percentage Ash
Eastern Kentucky						
Alabama	541.4	44.9	13.1	12,373	1.0	9.6
Connecticut	818.0	0.0	3.0	13,139	0.5	6.3
Delaware	110.0	0.0	79.0	12,534	0.7	8.6
Florida	9,499.5	59.4	12.8	12,814	1.0	7.8
Georgia	11,141.5	77.6	20.6	12,305	1.5	10.6
Illinois	1,302.8	35.4	23.8	13,074	0.7	6.7
Indiana	729.5	44.7	23.2	12,713	0.7	7.6
Kentucky	7,913.9	68.9	53.8	12,130	1.1	11.0
Maryland	320.0	96.0	4.0	13,063	0.8	8.6
Michigan	10,017.1	51.8	20.9	12,650	0.8	8.7
Mississippi	2,667.7	4.3	20.5	12,877	0.8	7.4
Missouri	7.0	100.0	100.0	11,000	1.3	12.0
New Jersey	19.9	0.0	100.0	12,917	0.7	7.4
New York	706.2	0.0	0.0	13,107	0.5	8.0
North Carolina	7,857.1	44.1	9.8	12,608	1.0	8.7
Ohio	7,944.7	62.3	39.8	11,762	1.3	12.7
Pennsylvania	13.1	100.0	0.0	12,282	1.0	9.1
South Carolina	7,841.5	38.3	30.2	12,609	1.1	9.5
Tennessee	5,698.2	52.8	9.9	11,953	1.3	11.5
Virginia	2,021.6	47.6	57.6	12,803	1.1	8.3
West Virginia	469.1	96.3	10.3	12,329	0.9	9.4
Wisconsin	158.7	57.3	100.0	12,869	0.9	7.7
Subtotal	*77,798.4*	*54.4*	*24.9*	*12,444*	*1.1*	*9.7*
Western Kentucky						
Alabama	1,115.4	33.4	61.5	11,933	3.0	12.3
Florida	5,017.8	23.2	57.8	12,258	2.9	9.1
Georgia	1,754.6	92.0	20.6	11,779	2.9	10.1
Illinois	1,114.8	66.3	24.1	11,660	2.2	8.7
Indiana	3,085.2	65.7	31.4	11,699	3.4	11.1
Iowa	33.7	100.0	100.0	12,155	3.5	11.0
Kentucky	15,187.6	34.1	17.7	11,128	3.6	13.8
Mississippi	814.5	100.0	47.0	12,229	2.5	7.6
Missouri	7.2	97.1	97.1	11,013	2.3	11.9
Ohio	357.5	40.9	82.8	11,585	2.5	8.2
Tennessee	9,555.7	54.6	3.5	11,879	2.7	8.5
Wisconsin	51.0	100.0	0.0	12,189	1.5	6.4
Subtotal	*38,095.1*	*45.6*	*23.4*	*11,611*	*3.2*	*11.1*
Total	**115,893.5**	**51.5**	**24.4**	**12,170**	**1.8**	**10.1**

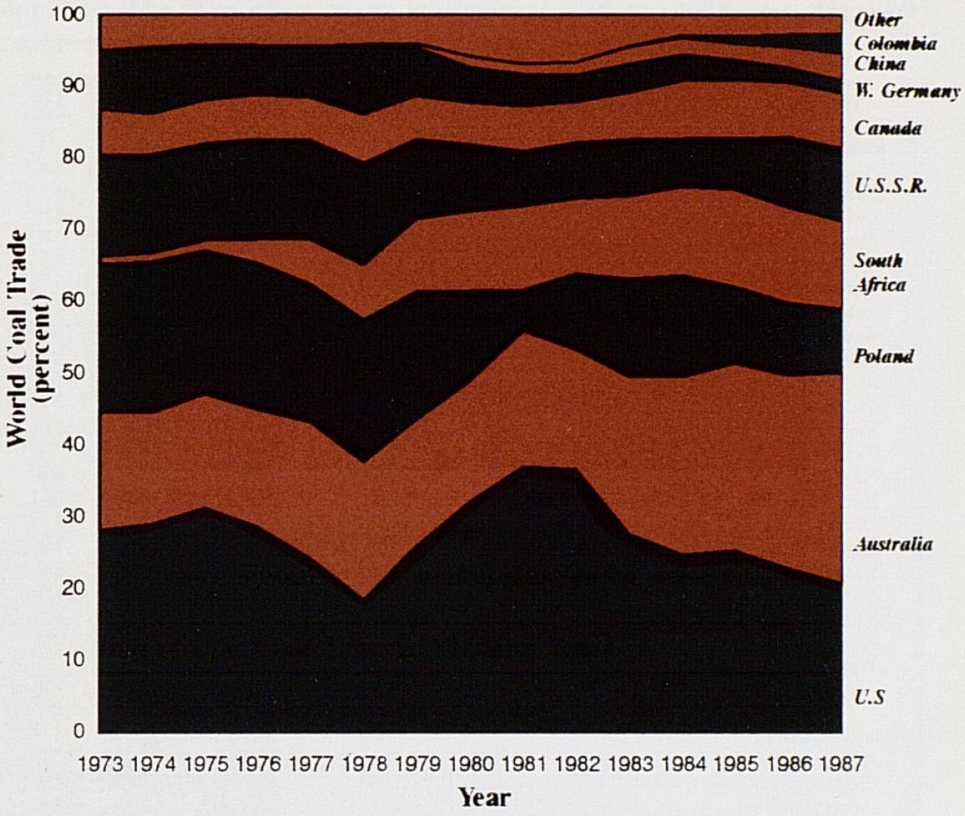
Distribution of Ky. Coal Shipments to Utility Plants by Sulfur Content *



Percent Sulfur Range	Millions of tons in Sulfur Range EKY	WKY
0.0–0.5	0.5	0.0
0.5–1.0	37.6	0.0
1.0–1.5	28.9	0.4
1.5–2.0	8.0	1.3
2.0–2.5	1.9	3.1
2.5–3.0	0.6	15.8
3.0–3.5	0.2	6.2
3.5–4.0	0.0	5.7
4.0–4.5	0.0	4.1
4.5–5.0	0.0	1.5

* ***1988*** values plotted at weighted average sulfur content within each sulfur range.
Source: U.S. DOE – Energy Information Administration. Form 423 data.

The U.S. Plays a Major Role in World Coal Trade



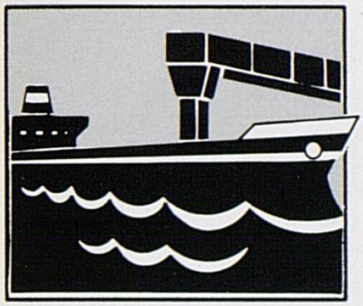
The U.S. has continued to lose market share in the world coal market.

Destination of U.S. Coal Exports (Million Tons)

Year	Canada	Brazil	Europe	Japan	Other	Total
1960	12.8	1.1	17.1	5.6	1.3	38.0
1961	12.1	1.0	15.7	6.6	1.0	36.4
1962	12.3	1.3	19.1	6.5	1.0	40.2
1963	14.6	1.2	27.7	6.1	.9	50.4
1964	14.8	1.1	26.0	6.5	1.1	49.5
1965	16.3	1.2	25.1	7.5	.9	51.0
1966	16.5	1.7	23.1	7.8	1.0	50.1
1967	15.8	1.7	19.4	12.2	1.0	50.1
1968	17.1	1.8	15.5	15.8	.9	51.2
1969	17.3	1.8	15.2	21.4	1.2	56.9
1970	19.1	2.0	21.8	27.6	1.2	71.7
1971	18.0	1.9	16.6	19.7	1.1	57.3
1972	18.7	1.9	16.9	18.0	1.2	56.7
1973	16.7	1.6	14.4	19.2	1.6	53.6
1974	14.2	1.3	16.1	27.3	1.8	60.7
1975	17.3	2.0	19.0	25.4	2.6	66.3
1976	16.9	2.2	19.9	18.8	2.1	60.0
1977	17.7	2.3	15.0	15.9	3.5	54.3
1978	15.7	1.5	11.0	10.1	2.5	40.7
1979	19.5	2.8	23.9	15.7	4.1	66.0
1980	17.5	3.3	41.9	23.1	6.0	91.7
1981	18.2	2.7	57.0	25.9	8.7	112.5
1982	18.6	3.1	51.3	25.8	7.5	106.3
1983	17.2	3.6	33.1	17.9	6.1	77.8
1984	20.4	4.7	32.8	16.3	7.2	81.5
1985	16.4	5.9	45.1	15.4	9.9	92.7
1986	14.5	5.7	42.6	11.4	11.4	85.5
1987	16.2	5.8	34.2	11.1	12.3	79.6

Source: Energy Information Administration. Coal Data: A Reference. 1989.

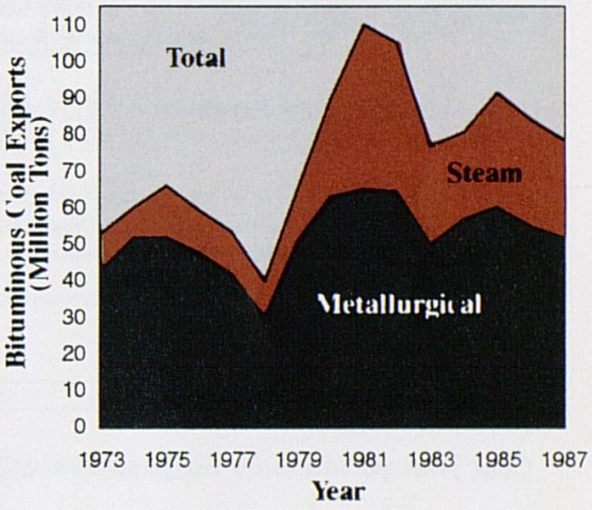
Exports



- The U.S. exported 95 million tons of coal in 1988, while importing only 2.1 million tons.
- Kentucky's contribution to the 95 million tons is estimated to be from 12% to 18% of the U.S. total.
- 1989 first quarter U.S. exports were up over 30% from 1988 first quarter exports. First quarter prices recovered slightly, after declining steadily since 1982.

U.S. Bituminous Coal Exports, Steam and Metallurgical

- Metallurgical coal has historically dominated U.S. bituminous exports, and is expected to continue to do so through the remainder of the century.
- Strong future demands for high quality steam coal may, however, cause the balance between metallurgical and steam exports to even out in the later years of the 20th century.



Source: Energy Information Administration, Coal Data: A Reference, 1989.

U.S. Imports

Year	U.S. Total Quantity (Millions)	U.S. Total Average Price/tons
1981	1.043	$28.47
1982	0.742	30.40
1983	1.271	33.59
1984	1.286	35.37
1985	1.952	36.04
1986	2.212	36.02
1987	1.747	32.04
1988	2.134	29.96
1989*	0.531	33.65

*First quarter values only.

- A closer look at 1989 first quarter imports shows 259 thousand tons at $33.19 per ton from Colombia; 190 thousand tons at $23.04 per ton from Canada; 65 thousand tons at $33.95 per ton from Venezuela; and 17 thousand tons at $29.24 per ton from other countries.
- Florida electric utility plants are the major recipients of imported coal from Colombia and Venezuela.

Source: Energy Information Administration, Quarterly Coal Report January–March, 1989.

Transportation

- Most Kentucky coal is transported by more than one mode of transportation because of cost considerations. and the location of the minesite and/or the customer.
- Kentucky coal is transported by rail. truck. and/or barge.
- Transportation if often more than one third of the cost of delivered coal.

Kentucky Coal Transportation System Distribution Estimate

Minesite

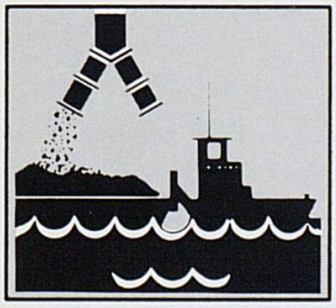
Distribution Modes

- 3% Minesite to barge facility via conveyor
- 17% Loaded directly to rail at the minesite
- 5% Other: unknown. refuse
- 75% Minesite to state-maintained highway
  - 4% Ky. power plants & other Ky. consumers
  - 12% Coal river terminals
  - 12% Truck - Other
  - 47% Rail loading facilities

1988 Kentucky Coal Production 161.2 Million Tons

Source: Governor's Office for Coal and Energy Policy estimates based on data from:
- Ky. Transportation Cabinet's Coal Haul Highway System. 1989 Report.
- U.S. DOE - Energy Information Administration. Coal Distribution. 1988.

Coal Transportation by Barge in Kentucky

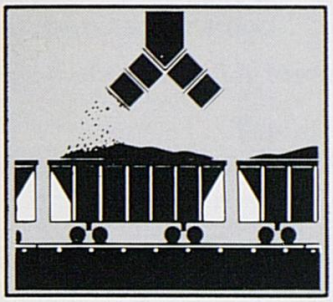


- Kentucky has more than 1,000 miles of navigable rivers over which 40 to 50 million tons of coal are shipped each year.
- Over 71 coal river terminals on the Ohio River and its tributaries which serve Kentucky coal shippers. Approximately 50 are within Kentucky's borders and 21 on opposite banks.
- 30 coal river terminals are located near Eastern Kentucky. 9 in Central Kentucky. and 32 near Western Kentucky.
- 29 of the coal river terminals have rail access. 58 have truck access. 26 have barge off-loading access. and 5 have conveyor access.
- 39 of the coal river terminals have automated blending. 30 have automatic sampling. and 43 have some coal processing equipment.

Source: Governor's Office for Coal and Energy Policy. Coal River Terminals Serving Ky..1989.

Transportation

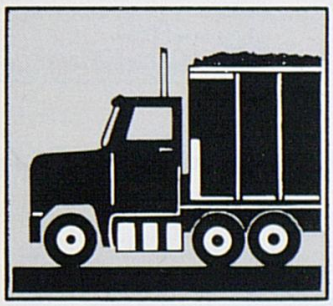
Coal Transportation by Rail in Kentucky



- Kentucky has over 2.700 miles of railroad lines. over which 103.1 million tons of Kentucky coal were transported in 1988.
- Kentucky has 2 Class I railroads. 2 Class II railroads. and 3 short line railroads that transport Kentucky coal.
- Kentucky has approximately 375 coal rail loading facilities. with 62% of the more efficient and modern facilities being active during 1988. Many of the older. less efficient facilities are temporarily inactive as excess capacity.
- Kentucky has 122 coal loading rail facilities with unit train service (79 provide 4 hour service. and 43 provide 24 hour service). Over 66.5 million tons of Kentucky coal moved by unit train service during 1988.
- Coal is the main commodity of Kentucky's rail industry which has over 7.100 Kentucky employees.

Source: Governor's Office for Coal and Energy Policy estimates based on data from:
- CSX Transportation. Inc.
- Norfolk Southern Corporation
- Paducah and Louisville Railway
- Tradewater Railway Company
- TransKentucky Transportation Railroad. Inc.

Coal Transportation by Truck in Kentucky



- Approximately 23% of Kentucky's 27.000 miles of state-maintained highways are used for transporting coal.
- In 1988 over 121 million tons of coal were shipped by coal truck (75% of 1988 Kentucky production).
- Over 80% of Kentucky toll roads are used to transport Kentucky coal: over 75% of the interstates in Kentucky and over 50% of the state primary roads were also used for coal transportation.
- Over 2.3 billion ton miles of coal transportation by truck were reported during 1988.
- Over 4.000 coal trucks were registered during 1988 in Kentucky: indicating that over 4.000 coal truck drivers were employed in Kentucky.

Source: Ky. Transportation Cabinet's Coal Haul Highway System. 1989 Report

Reclamation

- Mined land must be returned to its approximate original contours, with the exception of mountaintop removal operations, in accordance with the Federal Surface Mining Control and Reclamation Act of 1977.
- The 1977 law allows mountaintops to be reclaimed as flat land, which leaves the land more valuable for development.
- Reclaimed land must be as useful as the land was before mining, according to the 1977 law; often it is more useful.
- Stringent regulations govern the design, operations, and environmental impact of every mine.
- Mines and reclamation sites are inspected on a regular basis by state and federal inspectors.
- Kentucky coal operators paid nearly $380 million through 1988 into a federal program to reclaim land mined before today's stringent laws were passed.
- Kentucky coal operators must post bonds before surface mining begins.
- Under Kentucky's 1984 Permanent Program or "Primacy Program," bonds are not fully released until a coal operator has demonstrated five years of consecutive successful reclamation. (See chart.)

The Kentucky coal mining industry currently has over $870 million of reclamation bonds outstanding to assure timely and successful reclamation.

Bond Release Phase	Reclamation Release Type	% of Bond Released	Time/Phase Requirement
Phase I	Backfilling, Grading & Drainage	60%	Complete Landscaping
Phase II	Vegetation	25%	Approximately 2 Yrs. of Successful Reclamation
Phase III	Final	15%	5 Years of Consecutive Successful Reclamation

Successful Mining Reclamation – Primacy Bond Releases (1984 through July , 1989)

	Phase I			Phase II			Phase III		
Year	# of Releases	Acres * Released	Bond	# of Releases	Acres * Released	Bond	# of Releases	Acres * Released	Bond
1984									
1985	29	694	$ 1,514,314	2	84	$ 79,841			
1986	248	6,361	$16,781,470	—	—	—			
1987	332	8,379	$21,390,109	11	253	$ 289,767			
1988	561	15,583	$38,194,394	57	1,303	$1,261,810	1	14	$49,200
1989	446	16,777	$32,058,350	60	1,632	$1,967,811	1	997	$30,600
Total as of July, 1989	**1,616**	**47,794**	**$109,938,637**	**130**	**3,272**	**$3,599,229**	**2**	**1,011**	**$79,800**

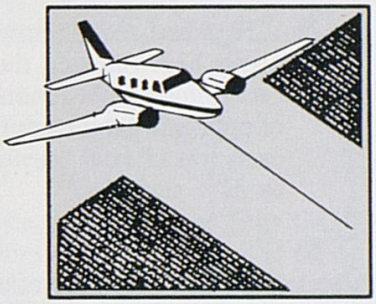
* Includes surface acreage over underground mines.

Sources: – Ky. Natural Resources and Environmental Protection Cabinet
– Dept. for Surface Mining Reclamation.

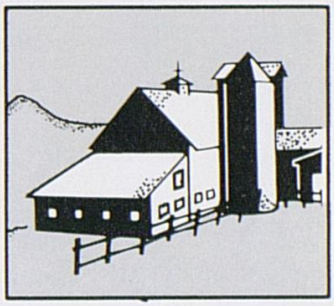
Reclaimed Land Use

Kentucky is deriving many benefits from reclaimed land in the form of wildlife refuges. airports. mountaintop farms. duck sanctuaries. parks. playgrounds. and level land for schools. hospitals. homes. businesses and churches.

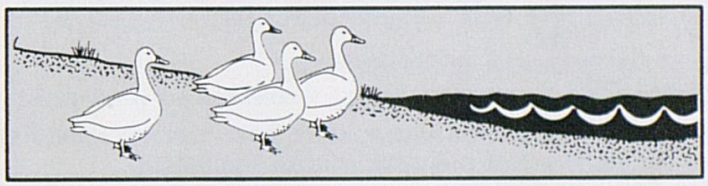
Sample Uses of Reclaimed Land



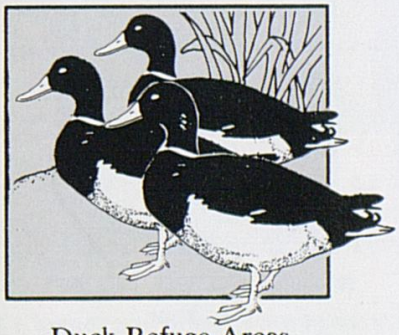
Regional Airports
Perry. Pike. Martin. and
Ohio Counties



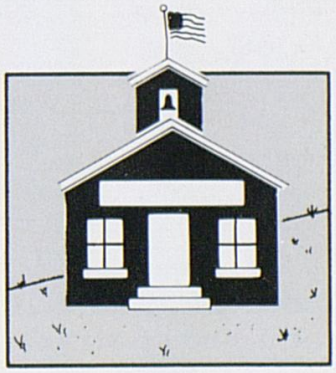
Mountaintop Farms
Perry. Breathitt. Martin. and
Pulaski Counties



Goose Down Production and Fish Farming
Greenup County



Duck Refuge Areas
Muhlenberg. Ohio. Perry. Breathitt.
Knott. and Martin Counties



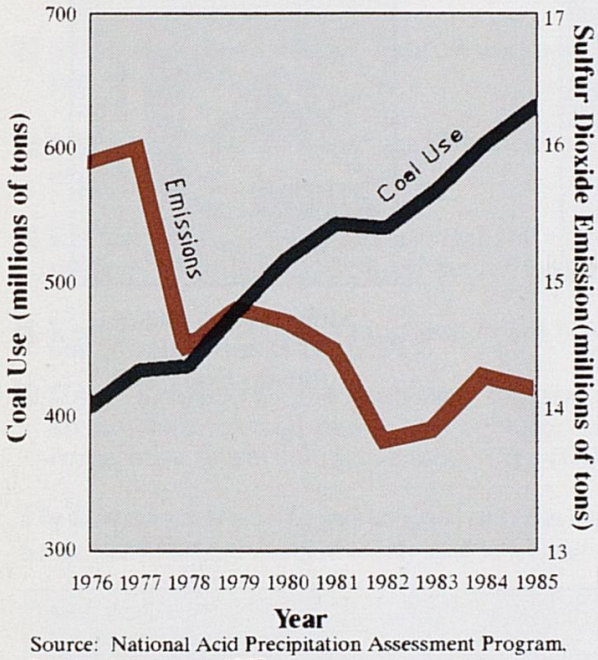
Sites for Homes. Schools.
Churches. and Businesses

Sources: – Governor's Office for Coal and Energy Policy
– Inside Environment. November. 1989.

Air Quality

Coal can be burned cleanly--although coal use is increasing. air pollution from coal is decreasing. The pollution most often associated with coal has historically been smoke and soot – called particulates. U.S. particulate emissions from coal burning have decreased by 86% since the Clean Air Act was passed in 1970. Sulfur dioxide emissions from coal are also of concern because they are one of the several causes of acid rain.

U.S. Coal Use and Sulfur Dioxide Emissions from Electric Utility Plants

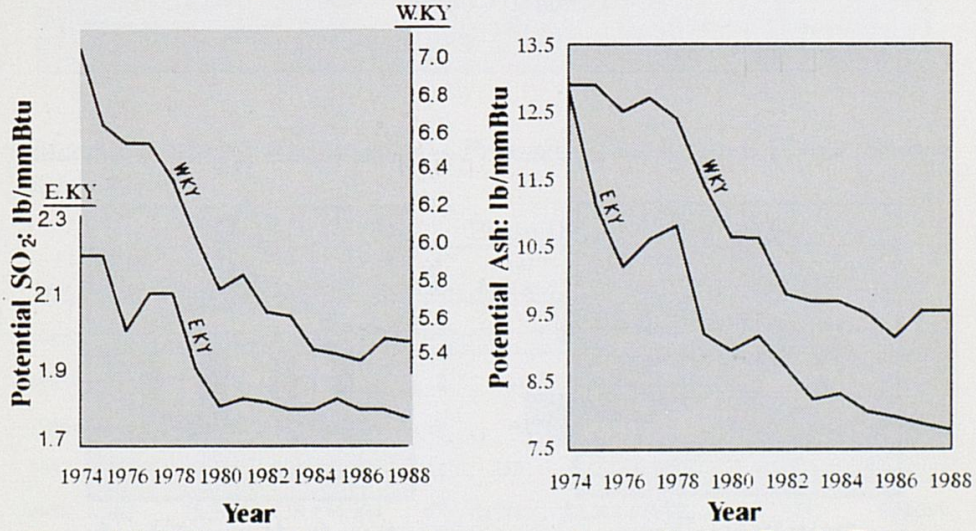


- U.S. coal–fired power plants have reduced their emission rate (the amount of pollution produced for each ton of coal burned) by 37% since 1977.
- U.S. sulfur dioxide emissions from fuel combustion (primarily coal) have decreased by 20%. even while power plants increased their coal use by 45%.
- In Kentucky. sulfur dioxide emissions were reduced by 50% between 1976 and 1984.

Source: National Acid Precipitation Assessment Program. Interim Assessment. 1987.

These reductions in air pollution have resulted from improvements in coal quality and from increased use of pollution control equipment.

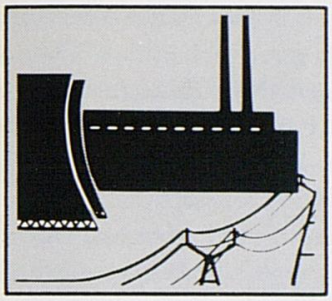
Improvements in Quality of Kentucky Coal Delivered to Electric Utilities



Source: U.S. DOE – Energy Information Administration. Cost and Quality of Fuels for Electric Utility Plants.

The quality of Kentucky coal delivered to electric utilities has improved due to coal cleaning and changes in mining practices. Since 1974. the sulfur content has decreased by 20% for Eastern Kentucky and by 22% for Western Kentucky: ash content has decreased by 39% for Eastern Kentucky and by 26% for Western Kentucky (both measured on a Btu basis).

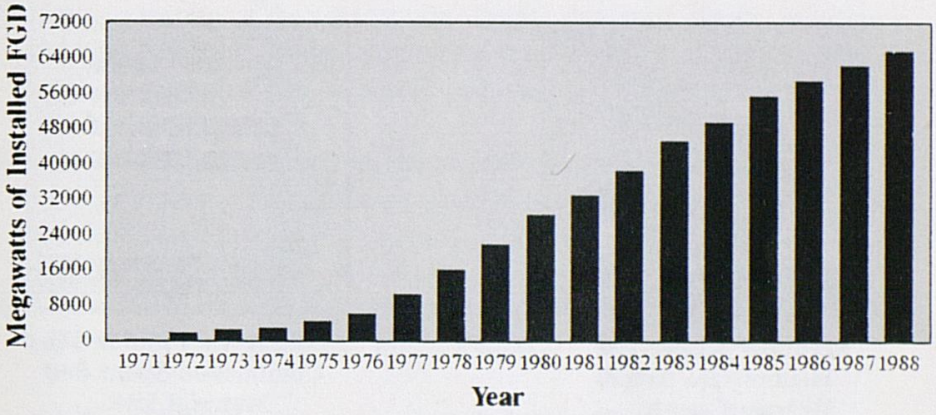
Air Quality



- The use of pollution control equipment on coal–fired power plants has increased dramatically.
- Virtually all older plants installed equipment to control particulates (smoke and soot) and many have installed scrubbers (flue gas desulfurization units) to control sulfur dioxide.

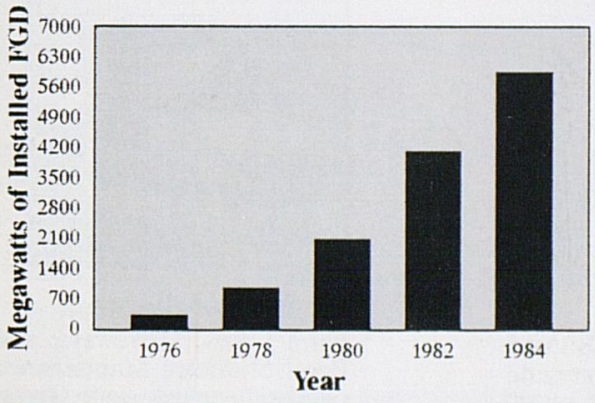
Every new coal–fired power plant is required to use the best available control technology.

Increased Use of Flue Gas Desulfurization (scrubbers) in the U.S.



Source: Electric Power Research Institute, Utility FGD Survey.

Increased Use of Flue Gas Desulfurization (scrubbers) in Kentucky



- Kentucky has historically ranked first in installed scrubber capacity; however, Kentucky was recently surpassed by Texas because of the large number of new plants in that state.

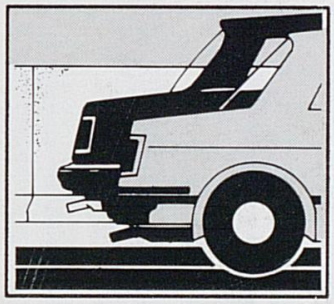
Source: Kentucky Energy Cabinet (Currently Governor's Office for Coal and Energy Policy), FGD Data Book.

- Cleaner and better ways to use coal are being developed and are generically called clean coal technologies. One of the most promising is fluidized bed combustion (FBC). The largest atmospheric fluidized bed combustion unit in the world is a 160 MW unit in Paducah, Kentucky, at TVA's Shawnee Steam Plant. This demonstration plant is a joint project of TVA, the Commonwealth of Kentucky, coal companies, electric utilities, railroads, and others. It began generating electricity in October 1988.

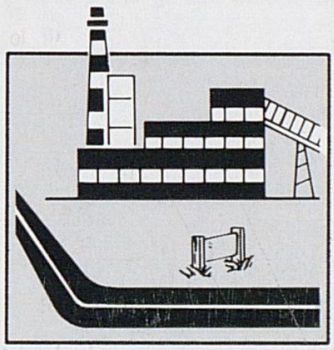
By-product Development

The generation and disposal of waste or by-products in the electric power generating process create a major concern for nuclear power generation. The disposal of waste or spent fuel creates huge environmental and financial burdens. However. coal-burning electric utility plants have developed many uses for their by-product waste material. Coal utilization by-products have a long useful history. Many people can recall using coal ashes to coat icy steps and walkways or to fill in a muddy driveway hole. Local road crews used ashes and cinders to coat slick roads in the winter in past years.

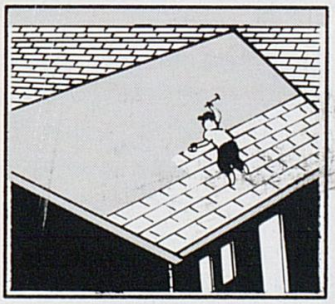
Some of the major by-products produced by today's coal-fired power plants are ***scrubber sludge, spent bed material, bottom ash,*** and ***fly ash.*** The following are just a few of the many current uses for coal-burning electric generation plant by-products in Kentucky.



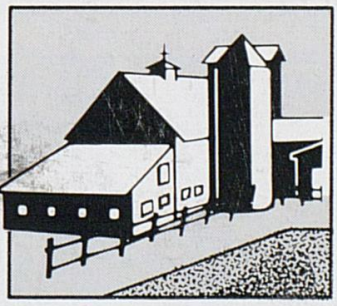
Scrubber Sludge Use:
Highway By-pass in
Webster County



Atmospheric Fluidized Bed Combustion Spent Bed Material Use:
Service Roads in
McCracken County



Bottom Ash Use:
Sand Blasting Materials and Asphalt Shingle Aggregate Factory in Muhlenberg County



Bottom Ash Use:
Farm Lanes. Driveways. and Road Shoulder Maintenance on the Pennyrile and Green River Parkways

There are also several new innovative uses of coal-burning electric utility plant waste currently in various stages of development. Some of the more widely publicized ones are:

- Building Brick
- Wallboard Manufacturing
- Cement Additives
- Aggregate Pellets

Water Quality

- The effects of mining on water sources are much less than the effects from other sources. For example, soil loss from agriculture accounts for 62% of Kentucky's sediment while natural geologic erosion accounts for 26%.

- Strict state and federal regulations deal with water during and after mining...on the minesite and on nearby streams and rivers.

- Before obtaining mining permits, the coal operator must determine the probable effects mining will have on the quality of surface and ground water.

- Surface and underground water is monitored during all phases of mining to protect the quality of the water, limit erosion, and prevent destructive flooding.

- Regulations require the interception of water, detention of water in sedimentation ponds, water quality monitoring at certain locations or special wells, and treatment of the water before releasing to streams and rivers.

- Before being discharged from the minesite, water must meet certain guidelines. When necessary, water is treated to neutralize acidity, remove minerals, and settle solids.

- An overview of some of the main water quality control processes used in Kentucky by the mining industry are as follows:

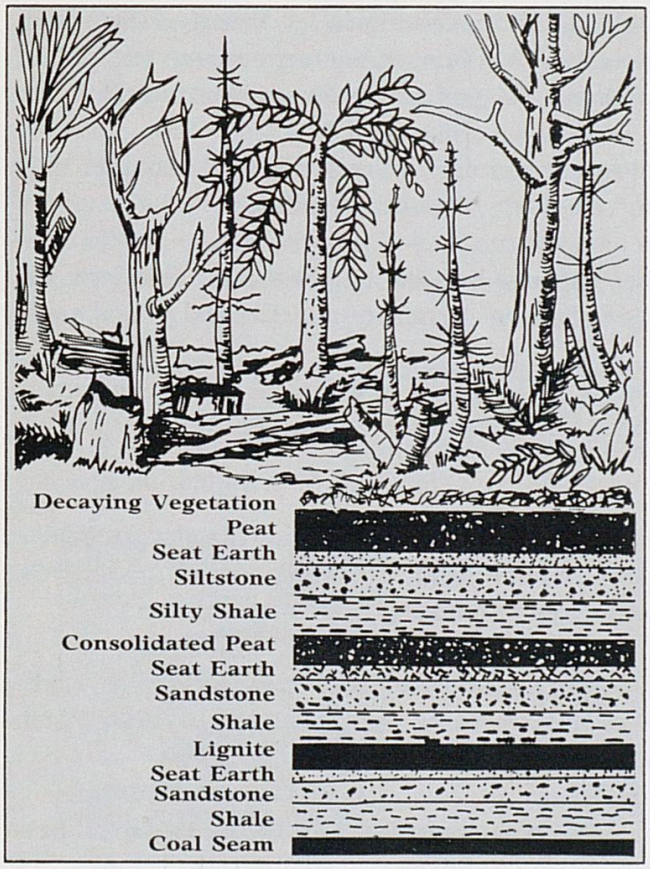
4,200	Coal related KPDES Permits	Kentucky Pollution Discharge Elimination System Permits (8000 total in Kentucky)
2,672	Coal related surface water monitoring points	Kentucky Natural Resources & Environmental Protection Cabinet's Dept. of Surface Mining
2,738	Coal related groundwater monitoring points/wells	Kentucky Natural Resources & Environmental Protection Cabinet's Dept. of Surface Mining

The above referenced discharge permits, monitoring points, and water quality structures are regulated by:

- Federal Water Pollution Control Act (1972)
- Federal Surface Mine Control and Reclamation Act (1977)
- Kentucky State Laws

Sources: - Resource Papers, Kentucky's Environmental Future – At What Cost, Governor's Ninth Annual Conference on the Environment, 1984.
- Kentucky Natural Resources and Environmental Protection Cabinet.

Coal Origin and Properties

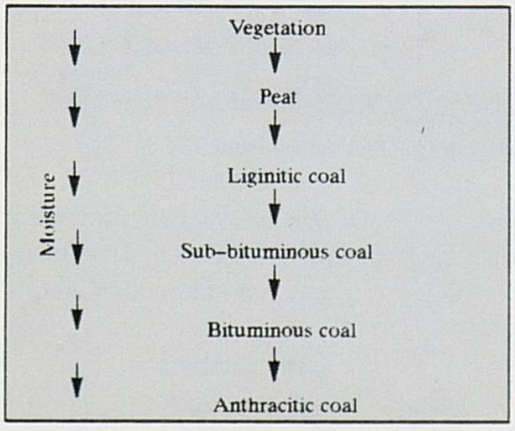


- It is generally accepted that coal originated from plant debris including ferns, trees, bark, leaves, and seeds that accumulated and settled in swamps.
- This unconsolidated accumulation of plant remains is called peat. Peat is being formed today in marshes and bogs.
- Layers of peat, covered by sediment receiving heat and pressure from the subsidence of the swamps, went through a metamorphic process called coalification to form coal.
- The metamorphic process is thought to have occurred in several stages over millions of years. The conditions of the metamorphic process and the swamps and bogs greatly affect the formation of the coal.
- Several factors which greatly affected the content, makeup, quality, and rank of the coal were:

Temperature	Fresh water/sea water
Pressure	Swamp acidity
Time	Types of plant debris
Layering process	Types of sediment cover

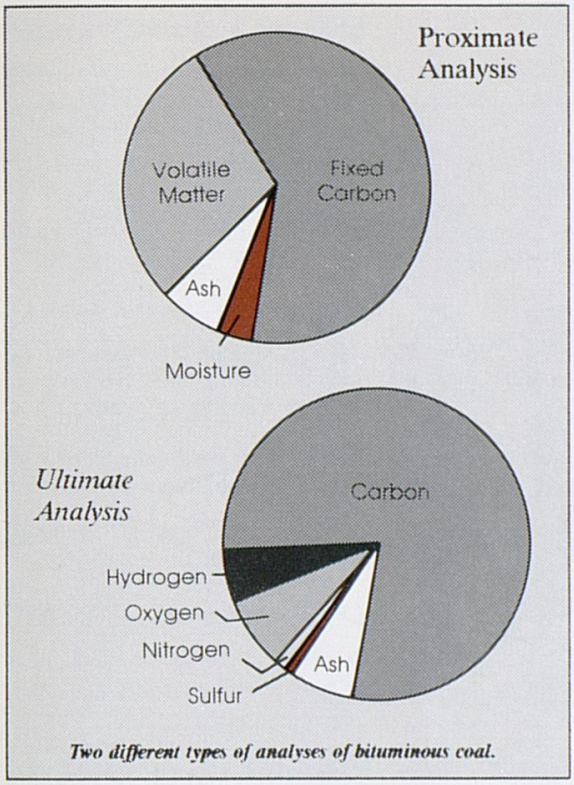
- Coal first formed from peat has a high moisture content and a relatively low heating value.

Coal Rank



- Moisture decreases, rank increases.
- Rank increases, fixed carbon increases.
- Rank increases, volatile matter decreases.
- Rank increases, heating value increases. (optimum Btu's at low–volatile bituminous)

37 Coal Properties – Improvements



Two different types of analyses of bituminous coal.

- Proximate analysis determines (on an as–received basis)
  –Moisture content

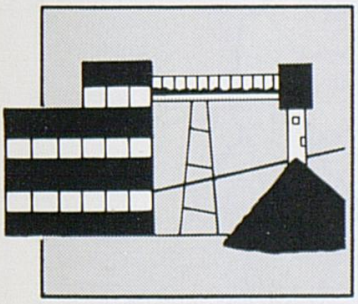
  –Volatile matter (gases released when coal is heated).

  –Fixed carbon (solid fuel left after the volatile matter is driven off).

  –Ash (impurities consisting of silica, iron, alumina, and other incombustible matter).
- Ultimate analysis determines the amount of carbon, hydrogen, oxygen, nitrogen, and sulfur.
- Heating value is determined in terms of BTU both on an as–received basis (including moisture) and on a dry basis.

Source: U.S. DOE – Energy Information Administration. Coal Data: A Reference, 1989.

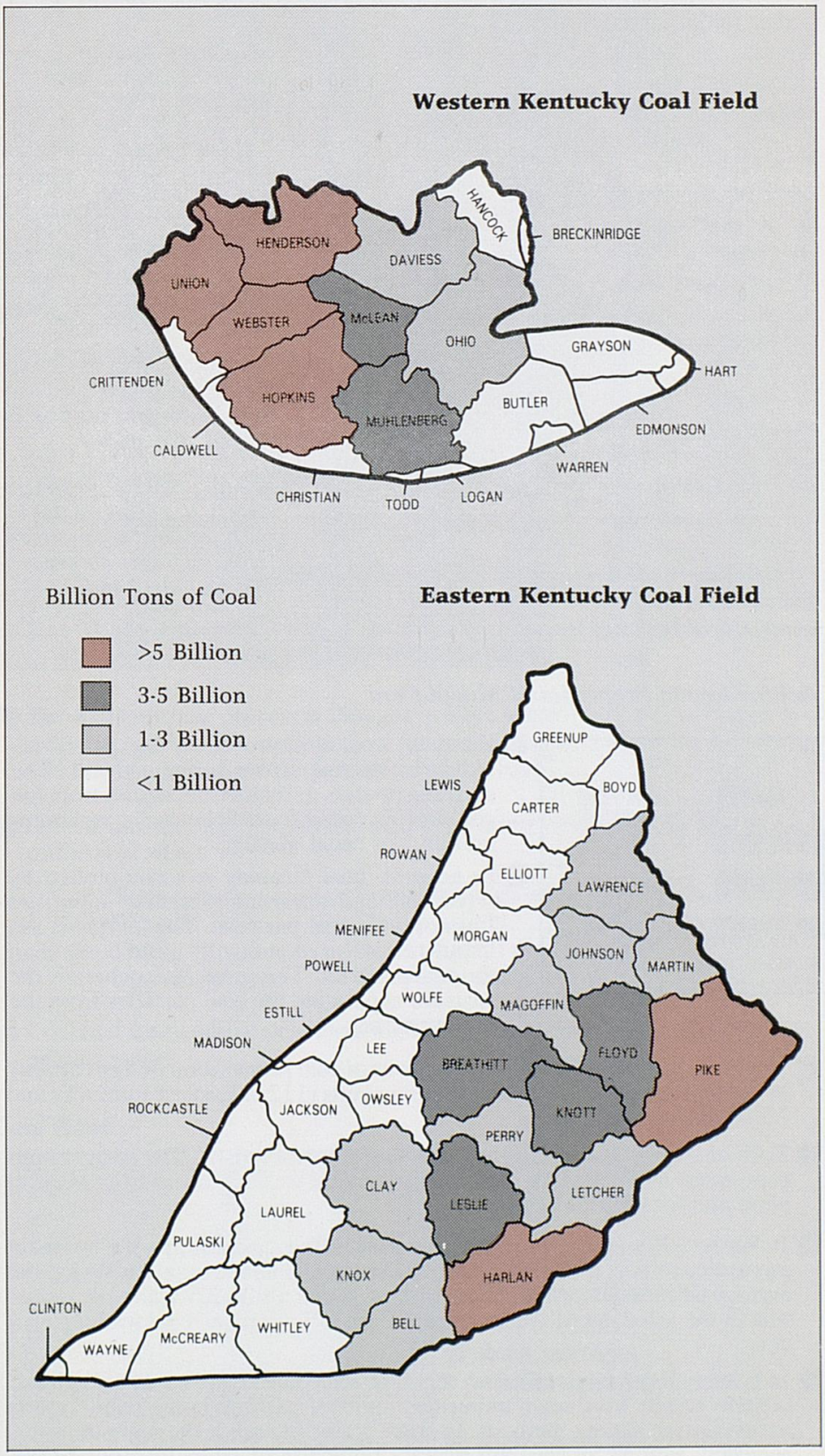
Improving the Properties of Mined Coal



- Kentucky coal is improved by the partial removal of the impurities sulfur and ash. The cleaning process to remove impurities from the coal is often called "beneficiation," "coal preparation," or "coal washing."
- In general, coal cleaning is accomplished by separating and removing inorganic impurities from organic coal particles. The inorganic ash impurities are predominantly more dense than the coal particles. This property is generally the basis for separating the coal particles from the ash impurities.
- Kentucky has over 70,000 tons per hour of coal preparation design capacity at approximately 144 coal preparation plants (112 in Eastern Kentucky and 32 in Western Kentucky).
- Each coal seam has a different washability characteristic. The range of improvement to a particular seam by mechanical washing varies from plant to plant and location to location.
- In Western Kentucky, the sulfur (inorganic sulfur) and ash are the two main impurities removed. Considering the 7 principal mined seams in W. Ky. the average sulfur content reduction ranges from 0.5% to 2.5% and the reduction in the ash content ranges from 9% to 13% after the coal washing process.
- In Eastern Kentucky, coals with very high ash contents are washed. High ash content results from seam impurities, splits or partings in the seam, or ash accumulating mining methods. In these seams the ash is the main impurity removed, with an average ash content reduction of 10 to 15% during the coal washing process and with only a slight reduction in the sulfur content.

Source: Developed from the Governor's Office for Coal and Energy Policy's Kentucky Coal Marketing Information System.

Kentucky's Coal Resources



Source: Updated from Brant & Other. Coal Resource Series. (1980–1983).

Western Kentucky Coal Field

- The Western Kentucky coal field covers 6,400 square miles and contains over 37 billion tons of remaining resources. (Part of this cannot be mined using today's technology.)
- There are 35 named coal beds, of which 7 principal coal beds contain about 94% of the resources in Western Kentucky.
- Over 3 billion tons of coal have been mined or lost due to mining, amounting to only about 7% of total Western Kentucky coal resources.

Eastern Kentucky Coal Field

- The Eastern Kentucky coal field covers 10,500 square miles and contains over 55 billion tons of remaining resources. (Part of this cannot be mined using today's technology.)
- There are more than 80 named coal beds in the Eastern Kentucky coal field which covers parts of 37 counties.
- Over 8 billion tons of coal have been mined or lost due to mining, amounting to only about 13% of total Eastern Kentucky coal resources.

1988 U.S. Demonstrated Coal Reserve Base (Millions of Tons)*

The U.S. Demonstrated Coal Reserve Base is an estimate of the tonnage that can be economically *mined with today's technology.**

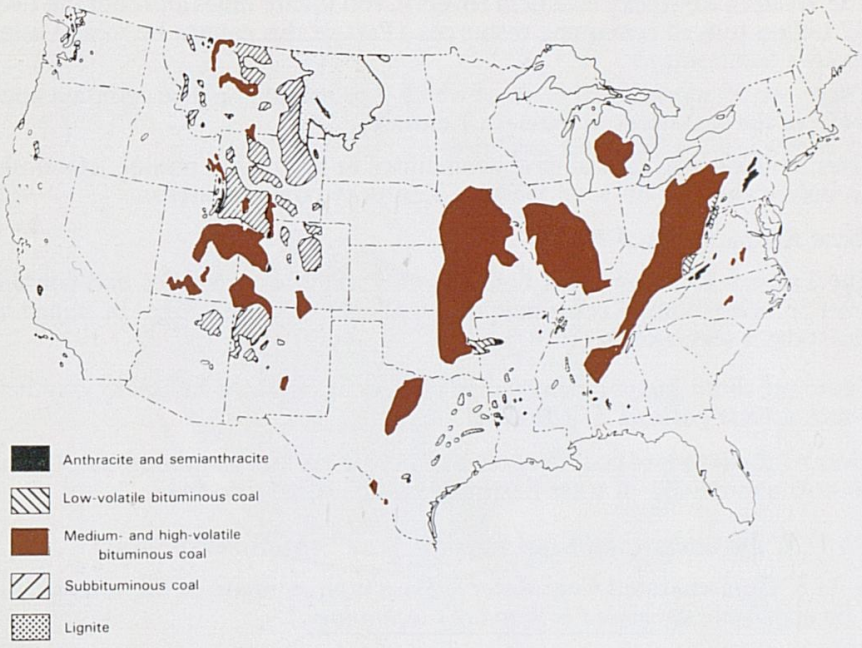
Coal Producing Region and State	Anthracite	Bituminous	Sub-bituminous	Lignite	Total* *
Appalachian Total	**6.8%**	**92.1%**		**1.1%**	**105,142.4**
Alabama		78.1%		21.9%	4,949.2
Georgia		100.0%			3.2
Kentucky, Eastern		100.0%			9,636.0 *
Maryland		100.0%			773.6
North Carolina		100.0%			10.7
Ohio		100.0%			18,616.3
Pennsylvania	24.0%	76.0%			29,467.1
Tennessee		100.0%			879.0
Virginia	4.4%	95.6%			2,877.9
West Virginia		100.0%			37,929.4
Interior Total	**0.1%**	**89.5%**		**10.4%**	**134,740.8**
Arkansas	24.9%	68.9%		6.2%	417.5
Illinois		100.0%			78,537.0
Indiana		100.0%			10,284.0
Iowa		100.0%			2,191.7
Kansas		100.0%			980.3
Kentucky, Western		100.0%			20,557.1
Louisiana				100.0%	498.9
Michigan		100.0%			127.7
Missouri		100.0%			6,016.7
Oklahoma		100.0%			1,596.0
Texas				100.0%	13,534.0
Western Total	**<0.1%**	**10.4%**	**76.8%**	**12.8%**	**234,641.2**
Alaska		11.4%	88.4%	0.2%	6,143.9
Arizona		100.0%			297.1
Colorado	0.2%	52.4%	22.9%	24.5%	17,070.2
Idaho		100.0%			4.4
Montana		1.2%	85.7%	13.1%	120,109.3
New Mexico	<0.1%	43.8%	56.1%		4,544.3
North Dakota				100.0%	9,737.5
Oregon			100.0%		17.5
South Dakota				100.0%	366.1
Utah		>99.9%	<.01%		6,254.3
Washington		21.1%	78.3%	0.6%	1,437.2
Wyoming		6.4%	93.6%		68,659.4
U.S. Total	**1.5%**	**51.0%**	**38.0%**	**9.5%**	**474,524.4**

* Kentucky coal resource values are considered by some to be too high of a value; while the Eastern Kentucky "Demonstrated Coal Reserve Base" value is openly rejected by many others as being too low.

** Millions of tons.

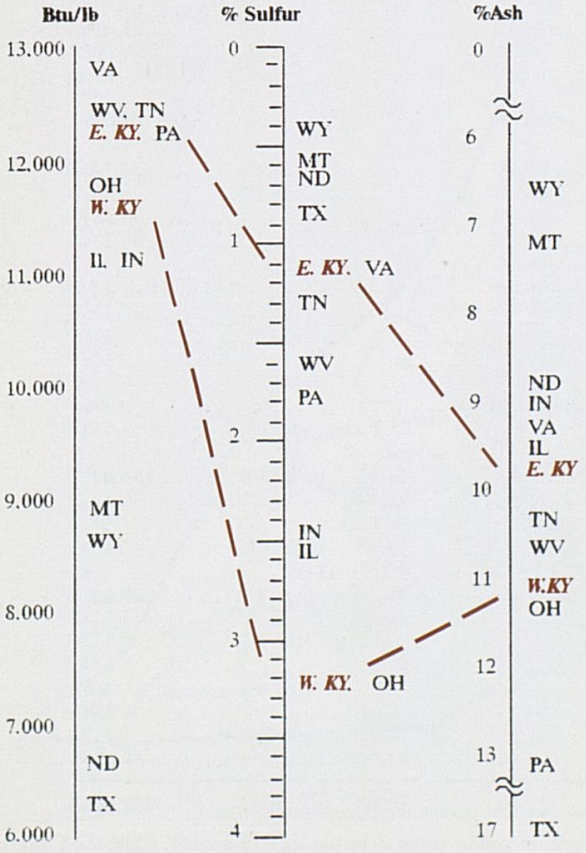
Source: U.S. DOE – Energy Information Administration. Coal Production. 1987.

U.S. Coal Fields and Coal Producing Areas

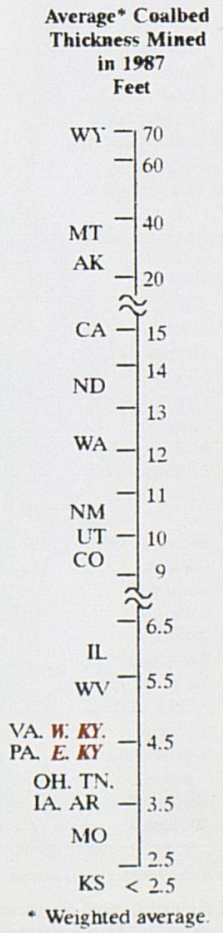


Source: Developed From the U.S. Geological Survey

Average Quality of Coal Produced for Power Plants By Selected Producing States, 1988



Source: Energy Information Adminstration. Cost and Quality of Fuels for Electric Utility Plants. 1988.



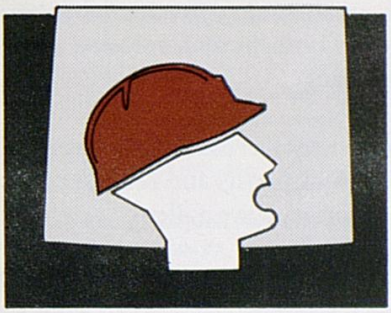
* Weighted average.

Source: Energy Information Administration. Coal Data: A Reference. 1989.

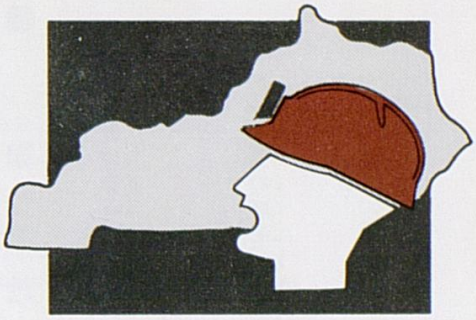
Ky. – Wyo. Coal

Wyoming Displaced Kentucky as the Leading Coal Producing State in 1988

Taking a closer look:



In Wyoming* .....



In Kentucky .....

- 35 to 60 feet of ***overburden*** are removed to mine 70 to 120 feet of coal.
- Wyoming coal shipped contains an average 0.4% ***sulfur.***
- It takes 115 lbs of Wyoming coal to produce one million ***Btu.*** (average 8.695 Btu/lb)
- A large portion of Wyoming's coal production contains 20 to 30% water or almost 1/3 water; this ***moisture*** content value is 10 times the moisture content of much of Eastern Kentucky's production.
- Wyoming coal is about 5.7% ***ash.***
- Coal is ***delivered*** to utilities in Wyoming at an average price of $15/ton.
- 97% of Wyo.'s 163.5 million tons of coal are sold to ***one market –electric utilities–*** and 147.0 million tons are sold on long–term contract.
- Almost all of Wyoming's coal is mined by ***surface*** mining.

- 35 to 60 feet or more of ***overburden*** are removed to mine 3 to 5 feet of coal.
- In 1988 E. Ky. coal shipped averaged 1.1% ***sulfur,*** W. Ky. coals averaged 3.2% ***sulfur.***
- It takes 80 lbs of E. Ky. coal (average 12,500 Btu/lb) or 86 lbs of W. Ky. coal to produce one million ***Btu.*** (average 11,628 Btu/lb.)
- A large portion of Eastern Kentucky's coal production contains 2 to 3 % ***moisture*** with other areas containing 4 to 5 %; Western Kentucky's production contains 6 to 8 % moisture.
- Kentucky coal is about 10% ***ash.***
- Coal is ***delivered*** to utilities in Kentucky at an average price of $24/ton.
- Ky. coal is sold to ***utilities, industries, and coking plants.*** Only 54.7% (and declining) of Ky.'s 161.2 million tons of coal are on long–term utility contracts.
- 61.5% of Kentucky's coal is mined from ***underground*** mines.

* Values are based on the Powder River Basin production, which accounted for over 96% of Wyoming's coal production during 1988.

Source: Estimates developed from data by :
- U.S. DOE - Energy Information Administration
- Wyoming's State Mine Inspector's Office
- Kentucky Department of Mines and Minerals

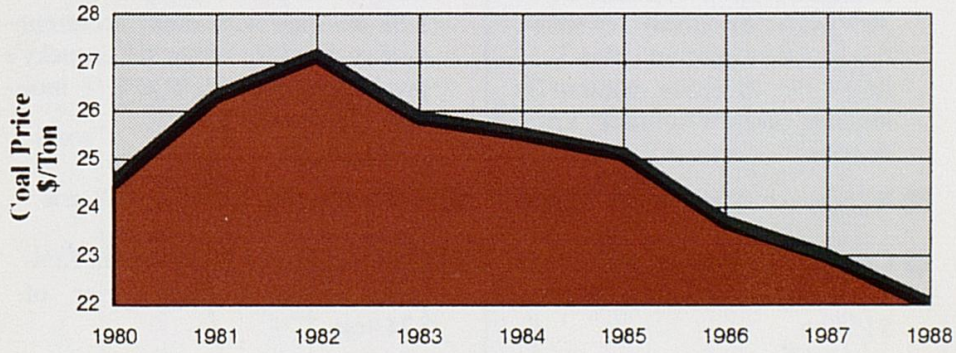
U.S. Coal Mining Productivity Average Tons/Miner/Hour *

Year	Underground	Surface
1960	1.33	2.91
1961	1.43	3.16
1962	1.50	3.40
1963	1.60	3.66
1964	1.72	3.76
1965	1.75	4.10
1966	1.83	4.28
1967	1.88	4.48
1968	1.93	4.33
1969	1.95	4.50
1970	1.72	4.53
1971	1.50	4.49
1972	1.49	4.54
1973	1.46	4.58
1974	1.41	4.74
1975	1.19	3.26
1976	1.14	3.25
1977	1.09	3.16
1978	1.04	3.03
1979	1.13	3.12
1980	1.21	3.27
1981	1.29	3.50
1982	1.37	3.48
1983	1.62	3.87
1984	1.72	4.10
1985	1.79	4.32
1986	2.00	4.69
1987	2.21	5.06
1988	2.38	5.41

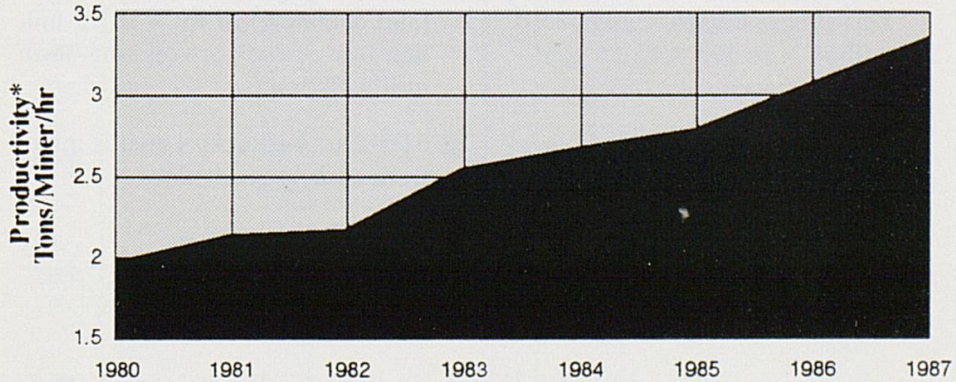
* Excludes anthracite.

- U.S. coal mining productivity has increased. both in underground and surface mines.
- Productivity increases have been necessary to lower costs and remain competitive as prices have fallen.
- The sharp increases in productivity during the last few years have mainly resulted from:
  - pressure from a declining market price
  - improved mining methods and increased mechanization
  - an increase in Western U.S. production
  - more efficient coal haulage
  - increasing use of continuous–mining machines
  - increasing use of longwall mining technology

U.S. Coal Prices in a Downward Trend Since 1982



U.S. Coal Mining Productivity Has Shown a Steady Increase Since 1980



* Weighted average.

Source: Energy Information Administration. Coal Data: A Reference. 1989. Coal Production. 1986–1988.

43 Energy Equivalents and Conversions

One *Btu* equals approximately:

1	blue-tip kitchen match

One *million Btu* equals approximately:

90	pounds of U.S. coal
120	pounds of oven-dried hardwood
8	gallons of motor gasoline or the amount it took in 1987 to move the average passenger car in the United States about 154 miles
10	therms of dry natural gas
11	gallons of propane

One ***million Btu of fossil fuels burned*** at electric utilities can generate about 100 kilowatt-hours of electricity, while about 300 kilowatt-hours of electricity generated at electric utilities can produce about 1 million Btu of heat.

One ***short ton of coal*** equals approximately:

106	days of coal consumption per person (U.S.-1988)
3.8	barrels of crude oil
21	thousand cubic feet of dry natural gas
6,500	kilowatt-hours of electricity consumed

One ***thousand kilowatt-hours (kWh) of electricity*** equals approximately:

35	days of electricity use per person (U.S.-1988)
0.59	barrels of crude oil (although it takes about 1.8 barrels of oil to produce 1,000 kWh)
0.15	short tons (or 310 pounds) of coal (although it takes about 0.47 short tons to produce 1,000 kWh)
3,300	cubic feet of dry natural gas (although it takes about 10,000 cubic feet to produce 1,000 kWh)

Source: U.S. DOE - Energy Information Administration, Energy Facts, 1988.

Handy Calorific Value Conversion for Coal*

Kcal/ Kg	Btu/lb	Kcal/Kg	Mj/Kg	Btu/lb	Btu/lb	Kcal/Kg
7500	13500				13500	7500
		7403	31	13227		
	13050				13000	7222
		7264	30	12897		
7000	12600				12500	6944
		6925	29	12467		
	12150				12000	6667
		6686	28	12037		
6500	11700				11500	6389
		6448	27	11607		
	11250				11000	6111
		6209	26	11177		
6000	10800				10500	5833
		5970	25	10748		
	10350				10000	5556
		5731	24	10318		
5500	9900				9500	5278
		5492	23	9888		
	9450				9000	5000
		5254	22	9458		
5000	9000					
		5015	21	9028		

* Conversion chart alignment is approximate and values are rounded to the nearest whole number.

Btu/lb	British thermal units per pound.	For more precise conversion between units —
Mj/Kg	Megajoules (a unit of work) per kilogram.	Kcal/Kg = 238.8 x MJ/kg
Kcal/Kg	Kilocalorie per kilogram.	Btu/lb = 1,800 x kcal/kg = 429.9 x MJ/kg

Source: Developed from source ideas by: BP Coal Limited, Coal Handbooks.

Information Assistance

- Governor's Office for Coal and Energy Policy
  (606) 252–5535

- Kentucky Coal Association
  (606) 233–4743

Kentucky coal data, information, and referral assistance to government, private organizations, and individuals are available from the following. Copies of ***Kentucky Coal Facts*** are available free of charge directly from the following offices or directly from the member companies of the Kentucky Coal Association.

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